STATE KEY LABORATORY OF MARINE GEOLOGY

2018 ANNUAL REPROT

海洋地质国家重点实验室

2018 年报

同济大学 TONGJI UNIVERSITY

实验室简介

同济大学海洋地质国家重点实验室成立于2006年。实验室以海洋及相邻陆区的环境演变与海底资源为总目标，以与国际接轨的深海基础研究为特色，以古海洋学与古环境、海洋沉积学、海洋岩石圈演化、油气资源勘探、海洋生物地球化学、海底过程与观测等为主要研究方向，重点开展西太平洋地球动力学与古环境演化研究。借助国际大洋钻探、国家长期海底科学观测等大型研究计划和平台，瞄准地球圈层系统和海陆相互作用中的重大科学问题，开展多时空尺度的基础研究，突出“地球系统科学”的理念，实现海洋与陆地结合，古代与现代结合，科学与技术结合的学科发展之路。实验室坚持国际化发展，依靠国内外的广泛合作和学科的交叉渗透，探索和发展海洋科学研究中的新思路、新途径和新方法。实验室将努力建设成为具有重要国际影响力的深海基础研究和创新性人才培养基地，同时担负起我国深海科学教育的社会责任，唤醒公众保护地球和海洋资源意识。

Goal and Mission

The State Key Laboratory of Marine Geology at Tongji University was established in 2006 with the endorsement from the Ministry of Science and Technology of China (MOST). The Goal of the Laboratory is to investigate environmental changes and natural resources in global oceans and neighboring continental regions, with an emphasis on Asian marginal seas. By actively involving in international ocean drilling and submarine observatories, and other large international research programs, the Laboratory is committed to understanding the comprehensive earth system science and the interaction between ocean and Earth's other spheres at various spatial and temporal scales.

The Vision of the Laboratory is to maintain unparalleled depth and breadth of expertise in marine geology across a range of oceanographic research areas.

The Mission of the Laboratory is to advance the understanding of interplay between ocean and land through broad national and international collaborations for cross-disciplinary integrations and the application of advanced instruments and novel techniques. The Laboratory is dedicated to communicating the new knowledge to the public for the benefit of society, to training future generations of ocean scientists and engineers, and to expanding public awareness about the importance of the global ocean and its resources.

实验室学术委员会

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副主任：焦念志、翦知湣

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Academic Committee

Advisor: Wang Pin-xian

Director: Wang Cheng-shan

Associate Director: Jiao Nian-zhi, Jian Zhi-min

Members: Yang Wen-cai, Chen Jun, Guo Zheng-tang, Chen Da-ke, Wu Li-xin, Li Jia-biao, Ding Kang, Lin Jian, Zhao Mei-xun, Gao Shu, Yang Sheng-xiong, Zhu Wei-lin, Zhou Huai-yang, Liu Zhi-fei

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主任助理：李建如

Executive Committee

Director: Yang Shou-ye

Deputy Directors: Cheng Jiu-bing, Cheng Hao

Director Assistant: Li Jian-ru

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2018 IN DIGITS

大事记
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一月
Jan.

1 月 5-7 日，海洋地质国家重点实验室与海洋与地球科学学院 2017 年度学术年会成功召开。年会系统总结了 2017 年度同济海洋学科在科研、外事等方面的重要进展，分析了 2018 年的形势和重要任务。

From January 5th to 7th, the 2017 Annual Academic Conference jointly by the State Key Laboratory of Marine Geology and School of Ocean and Earth Science was successfully held. The meeting provides a platform to systematically overview the important progress of the Tongji marine discipline in scientific research and foreign collaboration in 2017, and to explore the situation and important tasks in 2018.

三月
March

3 月，于洋助理教授入选 2018 年度上海市青年科技英才扬帆计划。蔡进功教授主持的研究项目《济阳坳陷古近系页岩油富集条件与有利区预测》荣获上海市科技进步二等奖。

In March, Assistant Professor Yu Yang was selected for the 2018 Shanghai Youth Science and Technology Talents Sailing Program. Professor Cai Jingong who led the project "The Accumulation Conditions and Favorable Area Prediction of Paleogene Shale Oil in Jiyang Depression" won the second prize of Shanghai Science and Technology Progress Award.

四月
April

4 月 17 日 -5 月 16 日，由同济大学主导、周怀阳教授担任首席的科学家团队开展南海遥控深潜科学考察航次。本室范代读、赵玉龙、马鹏飞、王虎、季福武、袁伟 、钱生平、李海洲、罗安、辛仁杰参加航次活动。这是国家自然科学基金委“南海深部过程演变”重大研究计划组织的一次重要科考活动。航次使用厦门大学 “嘉庚号”科考船，租用加拿大遥控无人深潜器“ROPOS”，在南海海底发现的古热液区和铁锰结核具有重要的科学研究和海底矿产资源调查意义。

From April 17th to May 16th, a team of scientists led by Tongji University with Professor Zhou Huaiyang as chief scientist carried out the remote sensing scientific cruise in the South China Sea. Laboratory members Fan Dai, Zhao Yulong, Ma Pengfei, Wang Hu, Ji Fuwu, Yuan Wei, Qian Life, Li Haizhou, Luo An and Xin Renjie participated in the voyage activities. This important scientific research activity was organized by the “South China Sea Deep” major research project, sponsored by the National Natural Science Foundation of China. The voyage uses Xiamen University's “Jia Geng” scientific research vessel with a remote unmanned deep submersible “ROPOS” on loan from Canada. The paleohydrothermal field and iron-manganese nodules found during the cruise have tremendous significance in scientific research and survey of seabed mineral resources.

4 月 26 日，同济大学“第三届国际青年学者论坛”海洋与地球科学学院分论坛举行。2 月、5 月、6 月和 12 月，实验室与海洋学院还在 Ocean Science Meeting, Goldschmidt 国际地球化学年会、美国石油地质学家协会 (AAPG) 年会、美国地球物理学会 (AGU) 年会上设展，开展全球招聘。

On April 26th, the Sub-Forum of the School of Ocean and Earth Science of the Third International Youth Scholars Forum of Tongji University was held. In February, May, June and December, the Laboratory and the School held exhibitions

for global recruitment at the Goldschmidt International Conference on Geochemistry, the annual meeting of the American Association of Petroleum Geologists (AAPG), and the annual meeting of the American Geophysical Society (AGU), respectively .

五月
May

5 月 3 日，同济大学与中国石油化工集团公司签订全面战略合作协议，将有力推动实验室服务国家重大需求和战略资源勘探能力。

On May 3rd, Tongji University and China Petrochemical Corporation signed a comprehensive strategic cooperation agreement, which will effectively promote the laboratory to serve the country's major needs and strategic resources exploration capabilities.

5 月 8 日，南海遥控深潜科学考察航次实现了国内首次深海海底深潜的实况直播，观众与海底机器人作业实时互动开辟了新型科普活动模式。

On May 8th, the Nanhai remote-controlled deep dive scientific expedition voyage realized the first live broadcast of the deep seabed deep dive in China. The real-time interaction between the audience and the submarine robot operation opened up a new mode for publicizing science activities.

5 月 10-24 日，汪品先院士乘坐我国自主研制的 4500 米载人深潜器“深海勇士”号，在 9 天里 3 次成功下潜南海千米以上水深，获得深水珊瑚等重要发现。实验室成员吴自军、李江涛、钟广法、李建如也多次下潜开展科考研究。此次下潜科考对于深化南海的科学研究及建立我国在南海科学上的主导权具有重要意义。“深海勇士”号成功下潜反响热烈，得到中央电视台、人民日报、新华社等国内主流媒体及美、德、法、澳等国家广泛、持续的关注和报道。

On May 10-24th, Academician Wang Pinxian took part in diving on the HOV Deepsea Warrior, a 4,500-meter manned submersible developed by China. He successfully dived three times in 9 days into over a thousand meter depth in the South China Sea and made important discoveries such as deep-water corals. Laboratory members Wu Zijun, Li Jiangtao, Zhong Guangfa, and Li Jianru also dived multiple times during the cruise. The diving scientific survey is of great significance for deepening scientific research in the South China Sea and establishing China's leading power in the South China Sea science. The success of the "Deep Sea Warrior" cruise has been responded with great enthusiasm and received extensive attention and coverage by domestic mainstream media such as CCTV, People's Daily and Xinhua News Agency, as well as agencies from the United States, Germany, France and Australia, among others.

七月
July

7 月 2-4 日，第五届地球系统科学大会在上海举行。会议设 36 个专题，吸引来自国内 180 余家单位的 1500 余名专家学者参加，超过以往各届。大会还特别设置了“青年学者论坛”环节，开辟了中国大洋钻探和大陆钻探专题展览。

On July 2-4th, the 5th Earth System Science Conference was held in Shanghai. The conference has 36 special topics, attracting more than 1,500 experts and scholars from more than 180 domestic institutions, a number significantly higher than in

previous sessions. The conference not only set up a special forum for young scholars but also opened up special exhibitions on the IODP and ICDP activities.

7 月 26 日，中国科学院上海天文台研究员，俄罗斯自然科学院院士和欧洲科学院院士金双根研究员同济大学兼职教授授证仪式在海洋学院举行。

On July 26th, Jin Shuanggen, a researcher of the Shanghai Astronomical Observatory of the Chinese Academy of Sciences, the Academician of the Russian Academy of Natural Sciences and the Academician of the European Academy of Sciences, accepted his fellow professorship of Tongji University at a ceremony held in the MGLab.

九月
Sep.

9-11 月，实验室科研工作环境建设取得重要进展。岩芯库、海洋化学分析室和海洋有机地球化学等分析室改建工程完工；临港实验室墙报、一楼大厅文化氛围建设完成；实验室网站近期完成改版。

From September to November, important progress was made in the construction of laboratory research work environment. The completed projects include: core library analysis room, marine chemical lab and marine organic geochemical lab; the Lingang laboratory poster exhibition and the first floor lobby for cultural exchange. In addition, the laboratory website has been recently upgrated.

十月
Oct.

10 月 10-12 日，国际海洋地球科学领域一次重要的学术盛会——第九届亚洲海洋地质大会（ICAMG-9）在同济大学召开。来自 25 个国家和地区 140 多家研究单位的 762 名参会。会议由海洋地质国家重点实验室(同济大学)、国际大洋发现计划（IODP）中国办公室和国家自然科学基金委共同主办。会议期间还举办了亚洲海洋地质大会 30 周年纪念活动，中国大洋钻探 20 周年成就展和优秀学生海报颁奖等系列活动。

On October 10-12th, another important academic event in the field of international marine geosciences - the 9th Asian Marine Geology Conference (ICAMG-9) was held at Tongji University, attended by 762 participants from more than 140 research units in 25 countries and regions. The conference was co-sponsored by the State Key Laboratory of Marine Geology (Tongji University), the International Ocean Discovery Program (IODP) China Office and the National Natural Science Foundation. During the conference, a ceremony for the 30th Anniversary of the Asian Marine Geology Conference, an exhibition showcasing the achievements of the 20th Anniversary of China Ocean Drilling and a ceremony to award the Outstanding Student Posters were also held.

10 月 10 日，聚焦“深潜、深网、深钻”科学应用的同济大学“深海科学馆”二期以全新的面貌重新开放。与目前的“深海探索馆”共同构成了同济大学深海科普教育基地。

On October 10th, the second phase of Tongji University's “Deep Sea Science Museum” focusing on the scientific application of “deep dive, deep network, deep drilling” was reopened with a new look. Together with the current “Deep Sea Exploration Pavilion”, it constitutes the deep-sea science education base of Tongji University.

10 月 11 日，同济大学与日本国立海洋研究开发机构（JAMSTEC）签订意向性合作协议。双方计划在海洋科技领域，特别围绕大洋钻探和海底观测等方面开展更密切的学术交流与合作。

On October 11th, Tongji University signed an intentional cooperation agreement with the National Ocean Research and Development Agency of Japan (JAMSTEC). The two sides plan to conduct closer academic exchanges and cooperation in the field of marine science and technology, especially in the areas of ocean drilling and seabed observation.

十一月
Nov.

11 月 7 日，海洋地质国家重点实验室第六届学术委员会第二次会议在京召开。会议由学术委员会主任王成善院士主持，汪品先院士、陈骏院士、郭正堂院士等十多位学术委员和国重室部分成员参加了会议。

On November 7, the second meeting of the Sixth Academic Committee of the State Key Laboratory of Marine Geology was held in Beijing. The meeting was presided over by Academician Wang Chengshan, Chair of the Academic Committee of the Lab. More than 10 academic members including Academician Wang Pinxian, Academician Chen Jun, and Academician Guo Zhengtang attended the meeting.

11 月 8-9 日，中国大洋钻探二十年学术研讨会在京召开，科技部、自然资源部、国家自然科学基金委员会等主管部门领导和来自于教育部、科学院等全国各系统 120 余位参与大洋钻探研究的专家学者与会。会上还发布了本实验室和中国大洋发现计划（IODP-China）编著的《大洋钻探五十年》，IODP-China 办公室目前设立在本实验室。

On November 8-9th, the 20-year China Ocean Drilling Symposium was held in Beijing. Attended by leaders of the Ministry of Science and Technology, the Ministry of Natural Resources, the National Natural Science Foundation of China and other competent departmental heads, as well as more than 120 experts and scholars involving in ocean drilling from Ministry of Education, the Academy of Sciences, and other affiliations. The " Fifty Years of Ocean Drilling" edited by the laboratory and the China Ocean Discovery Program (IODP-China, based at this lab) was released to mark the occasion.

十二月
Dec.

12 月 6 日，IODP368X 航次在南海获得 113 米基底玄武岩，将对南海深海盆最老洋壳年龄和南海形成历史提供重要约束。该航次是 2014 年实验室主导的 IODP349 航次的后续航次。

On December 6th, IODP Expedition 368X recovered 113 meters of basement basalt in the South China Sea, which will provide important constraints on the age of the oldest oceanic crust in the South China Sea deep sea basin and the history of the South China Sea. This voyage is the follow-up voyage of IODP Expedition 349 voyage led by the laboratory in 2014.

12 月 7 日，耿建华教授担任项目首席的国家重点研发计划《超深水海底飞行节点地震仪研发与油气勘探应用研究》启动会举行。该项目将为我国超深水油气地震勘探和科学研究提供新手段、新方法和新技术，填补了我国该技术领域空白。

On December 7th, with Prof. Geng Jian-hua as

the Principal Investigator, the kick-off meeting of the national key research and development plan project “Research and development of seismometers with ultra-deep water subsea flight nodes and their application in oil and gas exploration” was held. The project will provide new means, new methods and new technologies for seismic exploration and scientific research of oil and gas in ultra-deep waters, filling the gap in this technical field in China.

12 月 21 日 国家发展和改革委员会正式发文“关于海底科学观测网国家重大科技基础设施项目可行性研究报告的批复”。标志着由同济大学牵头的我国海底观测网正式步入开工建设阶段。

On December 21th, the National Development and Reform Commission issued an official letter "Reply on the Feasibility Study Report of the National Major Science and Technology Infrastructure Project of the Seabed Science Observing Network". It marks that China’s submarine observation network led by Tongji University is officially entering the construction phase.

12 月 23 日，王本锋研究员入选 2017-2019 年度中国地球物理学会“青年人才托举工程”。

On December 23th, Prof. Wang Benfeng was selected as the “Young Talents Lifting Project” of the 2017-2019 China Geophysical Union.

2018 年，汪品先院士出版《地球系统与演变》和《瀛海探径》两部著作，在国内取得重要反响。

In 2018, Academician Wang Pinxian published two books, "Earth System and Evolution" and "Yinghai Exploration", which achieved important repercussions in China.

2018 年度，我室新增纵向科研课题 48 项，合同经费 4821 多万元。获批 19 项国家自然科学基金项目，其中面上项目 13 项，青年基金 6 项。

In 2018, a total of 48 new research projects were approved to our lab, with a total budget of more than RMB 48.21 million. Among the19 projects approved by the National Natural Science Foundation, 13 are general projects and 6 are youth scholar funds.

2018 年，实验室在“气候演变的热带驱动“和”西太平洋地质演变“两大学术主题上，科研成果斐然。共发表第一单位第一作者 57 篇国际 SCI 期刊论文，其中一区论文 12 篇，包括两篇《Nature Geoscience》论文。

In 2018, the laboratory achieved breakthrough scientific research results in two major academic themes: “Tropical Drive of Climate Evolution” and “Western Pacific Geological Evolution”. A total of 57 international SCI journal papers were published as the first author of the first affiliation unit from the lab, including 12 papers in the first impact zone, with two papers in "Nature Geoscience".

Martin Wiesner 讲座研究员
Research Fellow
Prof. Martin Wiesner

德国汉堡大学博士（1983）

德国汉堡大学助理研究员（1983-1990）

德国汉堡大学生物地球化学 - 海洋化学研究所主任(1990-2003)

德国汉堡大学研究员（2003- ）

研究兴趣：地质学和生物地球化学方面的研究

Ph. D: University of Hamburg（1983）

Research Associate： University of Hamburg（1983-1990）

Head of Biogeochemical Laboratory: University of Hamburg（1990-2003）

Researcher: University of Hamburg（2003- ）

Research interest: Geology and Biogeochemistry

王本锋 研究员
Research Fellow
Wang Ben-feng

中国石油大学博士（2015）

同济大学青年百人 B 岗研究员（2018-）

研究兴趣：地球物理参数反演理论与方法

Ph. D: China University of Petroleum（2015）

Researcher: Tongji University（2018-）

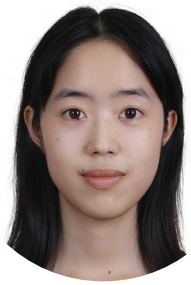
Research interest: Inversion theory and method of geophysical parameters

新进人员
NEW MEMBERS

赵峦啸 副教授
Dr. Zhao Luan-xiao
Associate Professor

李超 副教授
Dr. Li Chao
Associate Professor

朱晓军 副研究员
Dr. Zhu Xiao-jun
Associate Researcher



陈琼 助理教授
Dr. Chen Qiong
Assistant Professor

陈璞皎 博士后
Chen Pu-jiao
Postdoctoral Fellow

武力 博士后
Wu Li
Postdoctoral Fellow

赵崇进 博士后
Zhao Chong-jin
Postdoctoral Fellow

连尔刚 博士后
Lian Er-gang
Postdoctoral Fellow

吴家望 博士后
Wu Jia-wang
Postdoctoral Fellow

李海洲 博士后
Li Hai-zhou
Postdoctoral Fellow

余梦明 博士后
Yu Meng-ming
Postdoctoral Fellow

涂俊彪 博士后
Tu Jun-biao
Postdoctoral Fellow

郝廷 博士后
Hao Ting
Postdoctoral Fellow

周苏 博士后
Zhou Su
Postdoctoral Fellow

贡艺 博士后
Gong Yi
Postdoctoral Fellow

Sgandha Awar 博士后
Postdoctoral Fellow

Selva Kumaran 博士后
Postdoctoral Fellow

王军建 科研助理
Wang Jun-jian
Research Assistant

王宇宁 科研助理
Wang Yu-ning
Research Assistant

温廷宇 科普专员
Wen Ting-yu
Education and
Outreach Manager

新增科研课题
NEW RESEARCH PROJECTS

2018 年度，实验室共承担的项目 278 个（其中纵向课题 180 项），合同经费计 2.55 亿。其中承担国家级项目 120 个，经费 1.60 亿，包括国家重点研发计划 2 项，一级课题 7 个，二级课题 8 个；国家重大专项子课题 9 个；国家自然科学基金重大研究计划课题 8 个，重点项目 5 个，杰青 1 个，面上项目 55 个，青年项目 14 个。本年度新增纵向科研课题 48 项，合同经费 4821 多万元，项目主要来源于国家自然科学基金委员会、科技部和上海市科委等。

In 2018, the laboratory has undertaken a total of 278 projects (including 180 vertical topics), with a contractual budget totalling RMB 255 million. Among them, there are 120 national-level projects with a budget of 160 million, including 2 national key R&D plans, 7 first-level projects, 8 second-level projects, 9 national major special sub-projects, and from the National Natural Science Foundation, 8 national research plan projects, 5 key projects, 1 National Science Fund for Distinguished Young Scholar, 55 general projects, and 14 youth projects. This year, 48 new research projects were approved, with a total budget of more than 48.21 million yuan. The projects are mainly from the National Natural Science Foundation of China, the Ministry of Science and Technology, and the Shanghai Municipal Science and Technology Commission.

部分新增项目
List of selected new projects

负责人 PI	项目名称 Project Title	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		
耿建华 Geng Jian-hua	超深水海底飞行节点地震仪研发与油气勘探应用研究 Research and Development of Ultra-deep Water Ocean Bottom Flying Nodes (OBFN) and Its Application for Oil and Gas Exploration	1430
杨群慧 Yang Qun-hui	无线节点研制及测试 The Development and Test of the Wireless Nodes	600
国家自然科学基金面上项目 General Program of National Natural Science Foundation of China		
杨风丽 Yang Feng-li	南黄海中生代构造演化与海相地层改造 Mesozoic tectonic evolution of the South Yellow Sea and post-reformation of marine strata	65
董良国 Dong Liang-guo	基于 OBC 四分量地震数据的三参数弹性波反射波形反演方法与应用研究 4C OBC seismic data based elastic reflection waveform inversion methods and applications for three medium parameters	65
刘传联 Liu Chuan-lian	南海始新世 - 渐新世钙质超微化石生物地层学与古海洋环境演变 Eocene-Oligocene calcareous nannofossil biostratigraphy and palaeoenvironments in the South China Sea	65

刘忠方 Liu Zhong-fang	全新世东亚季风变化及其降水同位素特征 Holocene East Asian monsoon variability and its isotopic expression	64
张艳伟 Zhang Yan-wei	强台风触发深海浊流垂直结构的高分辨率锚系观测研究 High-resolution mooring observation on vertical structure of typhoon-triggered deep-sea turbidity currents	64
赵西西 Zhao Xi-xi	晚中生代 - 新生代西太平洋的古纬度：利用国际大洋钻探项目岩芯和陆地样品的古地磁对比性研究 Paleolatitudes of the Western Pacific in Late Mesozoic-Cenozoic: comparative paleomagnetic investigation of ocean drilling cores and land samples	63
杨锴 Yang Kai	基于三角网格剖分模型的高斯波包立体层析成像 Gaussian-packet based stereotomography in triangulated models	63
王本锋 Wang Ben-feng	地震信号衰减特性分析及鲁棒 Q 值估计多道补偿方法研究 Research on attenuation analysis of seismic data and robust Q estimation for multi-channel compensation	63
赵峦啸 Zhao Luan-xiao	不同成熟度陆相有机质泥页岩地震岩石物理响应机理 Seismic rock physics characteristics of terrestrial organic shale at different maturity stages	63
李丽 Li Li	晚渐新世 - 中中新世东亚低纬区降水演化历史及其全球影响 Precipitation history in East Asia low latitudes during late Oligocene-mid Miocene and its global impact	62
钟广法 Zhong Guang-fa	南海北部洋陆过渡带的重力流沉积 Gravity-flow deposits in the northern continent – ocean transition of the South China Sea	62
许长海 Xu Chang-hai	东海陆架到南海北部晚中生代东亚汇聚边缘演变的岩浆弧记录 Late-Mesozoic arc-subduction-related igneous rocks from SW East China Sea to N South China Sea: Key constraints on East Asia convergent margin	62
翁成郁 Weng Cheng-yu	长时间尺度看过去几个冰期 - 间冰期旋回中南海北部周边陆地植被生态系统自然动态与全新世人类活动的深刻影响 Natural dynamics of the terristrial vegetation surrounding the northern South China Sea during last five glacial-interglacial cycles and the human impacts in the Holecene	61
国家自然科学基金青年项目 Youth Program of National Natural Science Foundation of China		
连尔刚 Lian Er-gang	我国边缘海海水氢氧同位素景观特征及其地质应用 Seawater isoscape($\delta^{18}O$ and $\delta^{2}H$) for the marginal China seas and its geological implications	29.34

新增科研课题
NEW RESEARCH PROJECTS

武力 Wu Li	末次盛冰期以来南极罗斯海冰 - 海相互作用的硅藻稳定同位素制约 Ice shelf—sea water interactions on the Ross Sea continental shelf, Antarctica since the Last Glacial Maximum, constrained by oxygen, carbon and nitrogen isotopic compositions of sedimentary diatoms	25
马鹏飞 Ma Peng-fei	南海北部渐新世洋陆过渡带构造演化的沉积响应研究 Sedimentary response to Oligocene tectonic evolution of the continent-ocean transition zone in the northern South China Sea	25
吴家望 Wu Jia-wang	重建地中海腐泥层时期的温盐环流—基于鱼骸化石和有孔虫的古海水 Nd 同位素研究 Mediterranean thermohaline circulation during sapropel periods – reconstructed using Nd isotopes in fish debris and foraminifera	25
陈璞皎 Chen Pu-jiao	上新世暖期南海北部上层海水 pCO_2 变化及其影响因素 Changes of surface-subsurface seawater pCO_2 in the northern South China Sea during the Pliocene warm period and their controlling factors	25
赵崇进 Zhao Chong-jin	天然地震与海底大地电磁数据联合反演西太与菲律宾海板块俯冲结构 Joint inversion for the data of seismology and seafloor magnetotelluric in the subduction zone of Western Pacific and Philippines Sea plate	25
金晓波 Jin Xiao-bo	利用颗石藻生理作用来校正烯酮古 CO_2 气压计中的 b 值 Calibrating the b value in alkenone-based CO_2 paleo-barometer by using coccolithophore physiology	22
中组部人才类项目		
杨守业 Yang Shou-ye	第三批“万人计划”科技创新领军人才 The third batch of "10,000 people plan" technology innovation leading talents	80

重点项目课题介绍
Major Projects

1、超深水海底飞行节点地震仪研发与油气勘探应用研究 (No. 2018YFC0310100)

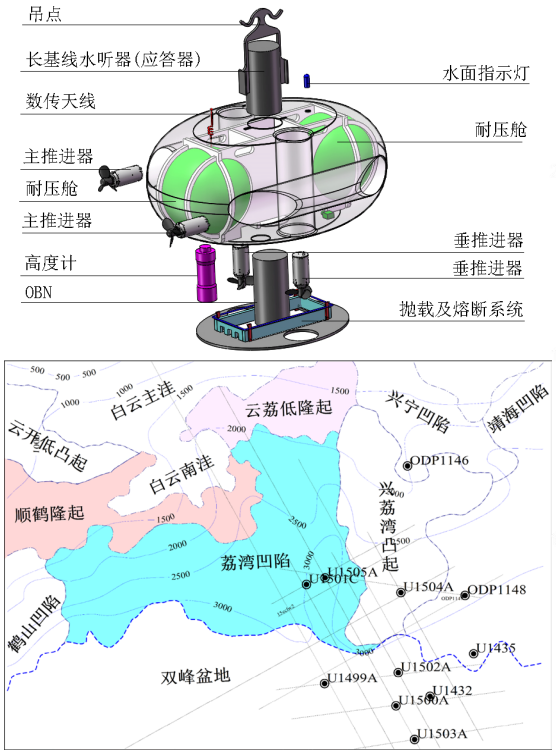
Research and Development of Ultra-deep Water Ocean Bottom Flying Nodes (OBFN) and Its Application for Oil and Gas Exploration (No. 2018YFC0310100)

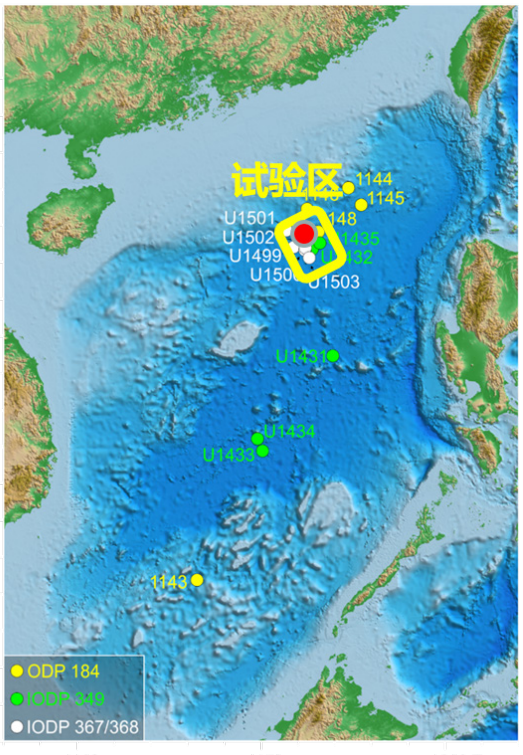
国家重点研发计划项目，2018.08-2021.12, 项目负责人：耿建华

National Key R&D Plan, 2018.08-2021.12, Project PI: Geng Jian-hua

该项目面向当前超深水油气勘探和科学研究需求，针对当前深水油气海底节点（OBN）地震勘探存在成本高、周期长等问题，开发带有自主导航定位与自主航行的海底飞行节点地震仪及其相关的地震数据处理与解释技术，结合南海大洋钻探资料，在南海北部超深水盆地开展试验应用，为我国超深水区油气勘探提供科学指导，也为我国建立具有自主知识产权的超深水油气地震勘探核心装备与技术提供支撑。

The project is oriented to the current demand for ultra-deep water oil and gas exploration. To overcome the shortcomings of the current ocean bottom nodes (OBN) used in deep water seismic exploration, which usually costs more and requires long-period operation, the primary objective of this project is to develop ocean bottom flying nodes (OBFN) with autonomous positioning and autonomous navigation as well as the relevant seismic data processing and interpretation techniques. Meanwhile, the developed techniques combined with the data from International Ocean Drilling Project (IODP) in the northern part of the South China Sea, will be used for the pilot test of ultra-deep water basins exploration. This research program will provide scientific guidance for ultra-deep water oil and gas exploration, and to lay the foundation of establishing core equipment and technology of ultra-deep water oil and gas seismic exploration with independent intellectual property rights in China.





新增科研课题
NEW RESEARCH PROJECTS

2、无线节点研制及测试（No.2018YFC1405803）

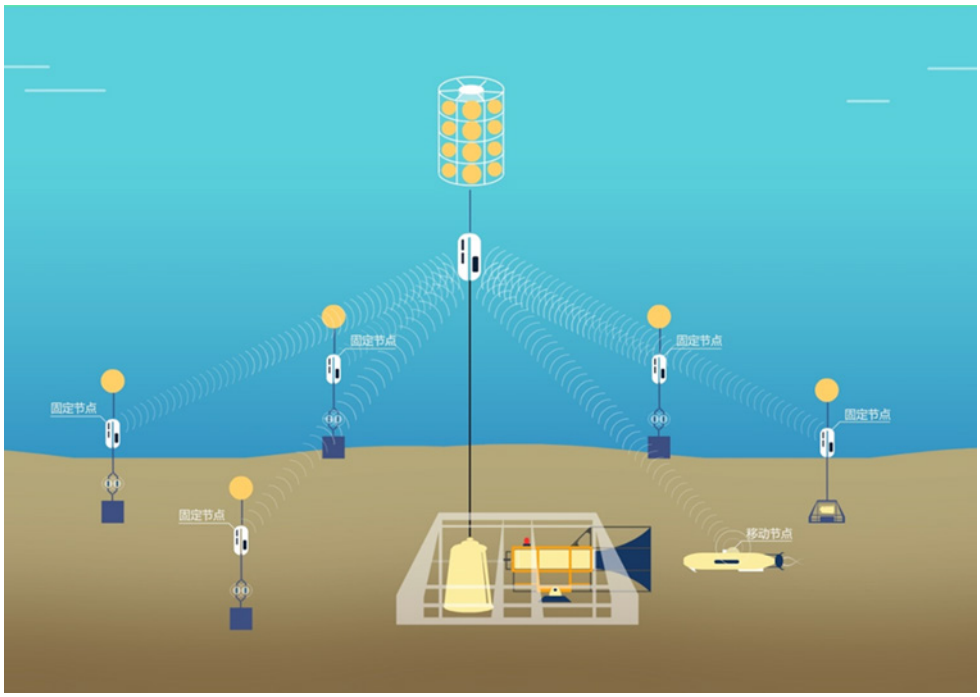
The Development and Test of the Wireless Nodes (No.2018YFC1405803)

国家重点研发项目课题 , 2018.08–2021.12, 课题负责人：杨群慧

National Key R&D Plan ， 2018.08–2021.12, Project PI：Yang Qun–hui

本课题隶属于“基于云 - 洋计算的深海海底观测网无线拓展观测系统”项目（No.2018YFC1405800）。课题将开展具有自主知识产权的无线固定节点和移动节点研发，构建由 1 个基于海床基实时供电和通信的深海先进锚系装置、4 个传统深海潜标装置组成的无线固定节点，以及一个具备声光结合自主引导对接技术的自主水下机器人移动节点共同组成的深海三维无线立体观测网络。各种环境监测传感器将搭载在无线固定和移动节点上，获得的观测数据经智能前端处理和融合后将实时远程无线传输至海底主基站。这种无线观测方式弥补了海底有缆观测网定点观测范围有限的不足，进一步拓展了观测范围。

This project belongs to the program of "Wireless Expansion Observation System of Deep-sea Seafloor Observatory Based on Cloud-Ocean Computing" (No.2018YFC1405800). It will carry out the development of wireless fixed and mobile nodes with independent intellectual property rights, including one advanced mooring based on the seabed platform’s real-time power supply and communication technology, four traditional deep-sea submerged buoys, one AUV with acoustic and optic combined with autonomous guided docking technology. The wireless fixed nodes and the wireless mobile node build a deep-sea 3D wireless network. Various environmental monitoring sensors will be mounted on wireless fixed and mobile nodes. Sensors’ observation data will be transmitted wirelessly to the seafloor base station in real time after intelligent front-end processing and fusion. This kind of wireless observation makes up for the deficiency of the cabled seafloor observatory’s insufficient observation range, and further expands the observation range.



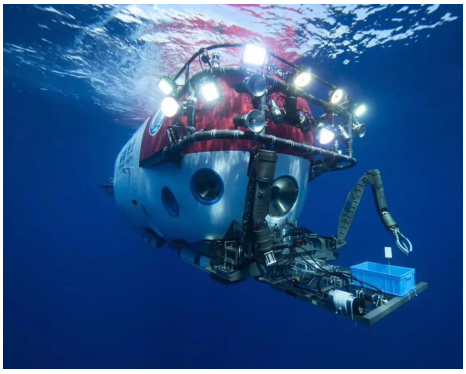
无线节点示意图

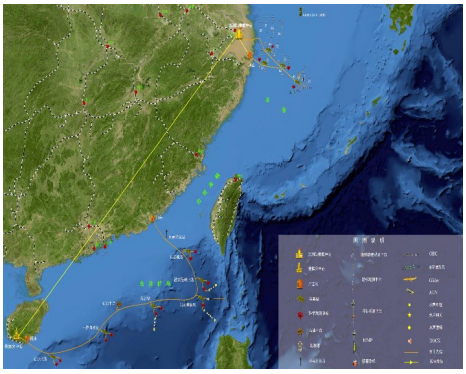
The Diagram of Wireless Nodes

“深钻”
DEEP DRILLING

“深潜”
DEEP DIVE

“深网”
DEEP OBSERVATORY





深钻
DEEP DRILLING

大洋钻探五十年：回顾与前瞻

Fifty years of scientific ocean drilling: Review and prospect

大洋钻探从1968年开始，中国在1998年加入，2018年是大洋钻探国际50年、中国20年的双重喜庆。值此欢庆之际，汪先生在《科学通报》撰文，对大洋钻探国际合作的曲折道路，对其科学发现的学术价值，和我国参加以来的经历进行回顾，对于大洋钻探的未来和我国进入其领导核心的道路进行分析。同时出版了《大洋钻探五十年》。

提出现代地质科学产生以来的两百多年里，二十世纪的六七十年代算得上是个英雄时期：以板块学说为标志的地学革命，横扫长期以来的陈旧观点，开创了地球科学的新纪元，而大洋钻探就是这场革命中的一面旗帜。世界各国将科技的精华集中到钻探船上，半个世纪来在世界各大洋深水底下钻井四千多口，取芯四十多万米，从根本上改变了人类对地球的认识，扭转了地球科学发展的轨迹。从组织的角度看，大洋钻探也是国际科学史上的奇迹：一项由各国政府出资的基础研究国际计划，然能历经50年而不衰，学术上的青春活力不减当年，相信其中必有缘故。这缘故就在于海洋的深邃广袤。深海是地球表面的主体：全球陆地面积加起来还不到三成，水深超过2000 m的深海却占了六成。现在的人类90%挤在10%的陆地上，奢谈着地球的可持续发展，而对于决定地球未来环境的深海却往往视而不见。大洋钻井犹如一枚枚神针穿越深水插入地球，捅破了深海之谜：认识了海底扩张，才懂得大陆山系的由来；解读了海底沉积，才找到气候演变的根源。50年来，深海始终是地球科学创新的源泉。文章指出，在大洋钻探的国际队伍里，中国只是个"新兵"。但是我们赶在20世纪落幕前加入其中，经过砥砺奋进，集中在南海深水实现了4个钻探航次，使之一举成为海底深部研究程度最高的边缘海，中国也因而成为国际大洋钻探最为活跃的国家之一。

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大洋钻探五十年：回顾与前瞻

汪品先

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现代地质科学产生以来的两百多年里，二十世纪的六七十年代算得上是个英雄时期：以板块学说为标志的地学革命，横扫长期以来的陈旧观点，开创了地球科学的新纪元，而大洋钻探就是这场革命中的一面旗帜。世界各国将科技的精华集中到钻探船上，半个世纪来在世界各大洋深水底下钻井四千多口(图1)，取芯四十多万米，从根本上改变了人类对地球的认识，扭转了地球科学发展的轨迹。从组织的角度看，大洋钻探也是国际科学史上的奇迹：一项由各国政府出资的基础研究国际计划，居然能历经50年而不衰，学术上的青春活力不减当年，相信其中必有缘故.

这缘故就在于海洋的深邃广袤. 深海是地球表面的主体. 全球陆地面积加起来还不到三成，水深超过2000 m的深海却占了六成. 现在的人类90%挤在10%的陆地上，奢谈着地球的可持续发展. 而对于决定地球未来环境的深海却往往视而不见. 大洋钻井犹如一枚枚神针穿越深水插入地球，捅破了深海之谜：认识了海底扩张，才懂得大陆山系的由来，解读了海底沉积，才找到气候演变的根源. 50年来，深海始终是地球科学创新的源泉[1].

在大洋钻探的国际队伍里，中国只是个"新兵". 但是我们赶在20世纪落幕前加入其中，经过砥砺奋进，集中在南海深水实现了4个钻探航次，使之一举成为海底深部研究程度最高的边缘海，中国也因而成为国际大洋钻探最为活跃的国家之一. 大洋钻探从1968年开始，中国在1998年加入，2018年是大洋钻探国际50年、中国20年的双重喜庆. 值此欢庆之际，需要对大洋钻探国际合作的曲折道路，对其科学发现的学术价值，和我国参加以来的经历进行回顾，对于大洋钻探的未来和我国进入其领导核心的道路进行分析，这是撰写本文的目的.

1 一波三折：大洋钻探的国际之争

科学道上无坦途，大洋钻探也不是个"顺产儿". 它的前身是美国的"莫霍计划"，试图从深海底下打穿地壳，穿越地壳和地幔之间的"莫霍面". 从1960年开始经过种种试验后，终于在1966年被撤销，夭折的原因是技术上尚未成熟、经济上不胜负担，其实莫霍钻的技术难点至今仍没有解决. 1968年"格罗玛·挑战者号"首航墨西哥湾，开始了美国的"深海钻探"计划(DSDP)(表1)，实质上就是将钻探宏

汪品先 同济大学海洋与地球科学学院教授，中国科学院院士. 长期致力于推进我国深海科技的发展. 1999年在南海主持中国海首次大洋钻探，现主持国家自然科学基金"南海深海过程演变"重大研究计划.

武岩的"莫霍计划"改变为钻探其上的沉积岩[2]. DSDP一路顺利，从1968–1983年，15年里完成了96个航次，钻探624个站位，取芯约9500 m，并且不断带来新发现. 第一个航次就在墨西哥湾一千多米水深下发现石盐层，而盐层底下的石油正是今天的勘探对象；第三个航次在大西洋发现海底地壳的年龄从洋中脊向外变老，从而证明了板块理论的海底扩张假说[3]. 深海钻探的成功引起了各国的注意，1975年苏联、英国、德国、日本和法国先后加入美国的计划，使得深海钻探进入"大洋钻探国际阶段(International Phase of Ocean Drilling, IPOD)"，成为举世瞩目的国际计划. 从此之后，大洋钻探就超出了科学领域，成为国际外交上一个新的敏感主题. 比如1979年底苏联出兵阿富汗，1980年以美国为首的深海钻探计划就剥夺了苏联的参与权利，直到现在俄罗斯也不是大洋钻探的成员.

1985年大洋钻探开始了被称为"ODP"的第二阶段(表1)，美国的钻探船也作了更新：10500吨的"格罗玛·挑战者号"，换成了近17000吨的"JOIDES 决心号"，设备更加先进. 大洋钻探的难度极大，"决心号"钻探船靠的是12个动力定位的强力推进器，和400吨的升降补偿装置，才能保持稳定，进行钻探[2]. 跨越世纪的ODP阶段，大洋钻探在20年里完成111个航次，在669个站位钻井，取回岩芯223000 m，发表国际论文7200篇，辉煌的成绩强化了美国领导下大洋钻探的国际地位，ODP末期参加的国家和地区达到22个，成为各国科学家合作与竞赛的深海奥林匹克[3]. 同时也不难想象，国际主导权之争也就随之而来.

20世纪在美国和欧洲联合体之外，长期发展深海科技的只有日本，在80年代经济达到顶峰的背景下，海洋上

“三深”进展
THREE DEEPS

Ocean drilling program began in 1968, and China joined in 1998, so 2018 became the year to celebrate the 50 years international ocean drilling and 20 years in China. For this celebration, Prof. Wang Pinxian reviewed in the "Science Bulletin", the tortuous road of international cooperation in ocean drilling, the academic value of its scientific discovery, and the experience since China’s participation, as well as the future of ocean drilling and China’s role. At the same time, To mark the occasion, the book《Fifty Years of Ocean Drilling》 was published.

In the two hundred years since the birth of modern geological science, the 1960s and 1970s can be regarded as a heroic period: the geoscience revolution marked by the plate theory has swept the long-standing old ideas and created a new era of earth science. Ocean drilling becomes a banner in this revolution, as countries have concentrated all the essence of science and technology on the drilling ship. In the past half century, more than 4,000 holes have been drilled under the deep waters of the world’s oceans. The core amounts to more than 400,000 meters, which has fundamentally changed human understanding of the earth and changed the path of earth science development. From an organizational point of view, ocean drilling is also a miracle in the history of international science: an international plan for basic research funded by various governments can survive for 50 years, and the youthful vitality of academic endeavours does not diminish. The reason is that the ocean is deep and vast. The deep sea is the main body of the earth’s surface: the global land area is less than 30%, while the deep sea with a depth of more than 2000 m accounts for 60%. Today, 90% of humans are crowded on 10% of the land, and they talk about the sustainable development of the earth, but they often turn a blind eye to the deep sea that may determine the future environment of the earth. Ocean drilling is like a needle inserted into the earth through deep water, breaking through the mystery under the deep sea. Knowing the expansion of the seabed, we can understand the origin of the continental mountain system; understanding the sediments from the seabed, we can recover the root of climate evolution. For 50 years, the deep sea has always been the source of earth science innovation. The article also pointed out that in the international team of ocean drilling, China is only a "newly recruited member." We joined the organization just before the end of the 20th century. After hard work, we concentrated on four drilling expeditions in the deep waters of the South China Sea, making it one of the most researched seas in the world. China has thus become one of the most active countries in international ocean drilling.

《Nature Geoscience》发表 IODP 367/368 航次最新研究成果

《Nature Geoscience》 published the latest research results of IODP 367/368 expeditions

2018 年 8 月 20 日，国际著名地学杂志《Nature Geoscience》以“Rapid transition from continental breakup to igneous oceanic crust in the South China Sea”为题发表了 IODP367/368 航次关于南海陆缘张裂形成洋壳的最新研究成果。这项研究由 IODP 367/368 航次的全体船上科学家共同完成，文章的第一和共同通讯作者为海洋地质国家重点实验室 Hans Christian Larsen 教授。该研究分析了 IODP 367/368 航次在南海北部获得的钻探和地震数据，发现在南海陆壳破裂过程中存在岩浆活动，即软流圈物质上涌造成岩石圈最终破裂，过程中伴随洋中脊玄武岩类型的岩浆活动，并最终形成狭窄的由陆壳向火成岩洋壳的过渡带。这一陆缘结构不同于在北大西洋发现的两种陆缘结构：1）没有任何富岩浆陆缘的特征，既没有巨厚的火成岩洋壳，也没有如东格陵兰边缘般倾向海洋方向的大于 5 km 厚的反射体；2）岩石圈快速扩张过程中未伴随地幔折返现象，即没有少岩浆陆缘的特征。这一陆缘结构被认为是北大西洋两种陆缘结构之间“缺失的环节”，尚未通过钻探证实，此次研究证实了这种陆缘结构的存在，并可用来解释先期存在裂痕的薄弱岩石圈快速断裂的过程。该研究对于揭示南海及其他边缘海成因具有重要意义。

On August 20, 2018, the internationally renowned journal 《Nature Geoscience》 published the latest research results of IODP expedition 367/368 on the formation of the oceanic crust of the South China Sea continental margin in an article entitled "Rapid transition from continental breakup to igneous oceanic crust in the South China Sea", completed by all shipboard scientists. The first co-author of the article was Professor Hans Christian Larsen, State Key Laboratory of Marine Geology. This study is of great significance for revealing the genesis of the South China Sea and other marginal seas. Please refer also to the detailed description in the following Research Highlights.

中国大洋钻探二十年学术研讨会暨中国 IODP 专家咨询委员会 2018 年度会议召开

Academic Seminar on the Twenty Years of China Ocean Drilling and China IODP Expert Advisory Committee 2018 Annual Meeting was Held

今年是国际大洋钻探 50 周年，中国参加大洋钻探 20 周年，为了系统总结和回顾我国参加大洋钻探二十年来的成绩和经验，谋划下一步的发展，2018 年 11 月 7-9 日，中国大洋钻探二十年学术研讨会暨中国 IODP 专家咨询委员会 2018 年度会议在北京召开。全国人大常委会副委员长、中国 IODP 专家咨询委员会主任丁仲礼院士、科技部原部长徐冠华院士、国家自然科学基金委员会副主任侯增谦院士、同济大学汪品先院士等来自科技部、自然资源部、国家自然科学基金委员会等主管部门领导和全国各系统参加大洋钻探航次和研究的 120 余位专家学者与会。丁仲礼指出：二十年来，我国通过参加大洋钻探计划，取得了一系列重大科学成果，在南海深海探索上，我国科学家所取得的成果尤为被国内外同行所瞩目。南海大洋钻探的成功，依靠的是国家的重视，依靠的是各部委的大力支持，依靠的是国内各部门的通力合作。会上，参加大洋钻探一线工作的科学家们共聚一堂，畅谈中国大洋钻探的未来发展大计，提出了面向 2023 年后中国大洋钻探的重点方向，包括全球季风与热带驱动、西太平洋地质演化与深部生命研究等重要研究领域，目前正在组织研讨提出巽他陆架自主钻探航次、花东海盆钻探等一系列新的科学建议书。

This year marks the 50th anniversary of international ocean drilling and the 20th anniversary for China's participation. In order to systematically summarize and review the achievements and experience of China's 20 years participation, and to plan the next IODP development direction, an Academic Seminar Twenty Years of China Ocean Drilling with the 2018 annual meeting of the China IODP Expert Advisory Committee were held in Beijing on November 7-9th, 2018. Academician Ding Zhongli, Vice Chairman of the Standing Committee of the National People's Congress and Director of the China IODP Expert Advisory Committee, Academician Xu Guanhua, former Minister of the Ministry of Science and Technology, Academician Hou Zengqian, Deputy Director of the National Natural Science Foundation of China, Academician Wang Pinxian of Tongji University, and other competent departmental leaders attended, together with more than 120 experts and scholars from the Ministry of Science and Technology, Natural Resources, National Natural Science and other funding agencies and organizations participated in the ocean drilling. Ding Zhongli pointed out that, in the past 20 years, China has made a series of major scientific achievements by participating in the Ocean Drilling Program. In the deep sea exploration in the South China Sea, the achievements of Chinese participants have been particularly noticed by scientists both at home and from abroad. The success of the South China Sea drilling relies on the attention of the state, the strong support of various ministries and commissions, and the cooperation between various departments in the country. At the meeting, scientists who participated onboard gathered together to discuss the future development of China's ocean drilling, and proposed the key directions for China's ocean drilling after 2023, which include global monsoon and tropical drive, western Pacific geological evolution and deep life. Work currently being organized include new scientific proposals for drilling on the Sunda Shelf and drilling of the Huadong Sea Basin.

大洋钻探 50 年报告会暨专著首发仪式在沪召开

50 Years of Scientific Ocean Drilling Workshop and Monograph Launching Ceremony Held in Shanghai

12 月 4 日，大洋钻探 50 年报告会暨专著首发仪式在上海科学会堂举行。中国科学院院士、同济大学教授汪品先在会上透露，中国正在争取成为国际大洋钻探的第 4 个平台提供者，并将自主组织航次，这标志着中国已经跻身海洋研究前列。汪品先同时透露，中国科学家正在争取于 2020 年举办国际大会，与国际科学家一道研讨制定新十年大洋钻探科学计划。

On December 4th, Workshop on the 50th Anniversary of Scientific Ocean Drilling with the launching ceremony of the monograph was held in the

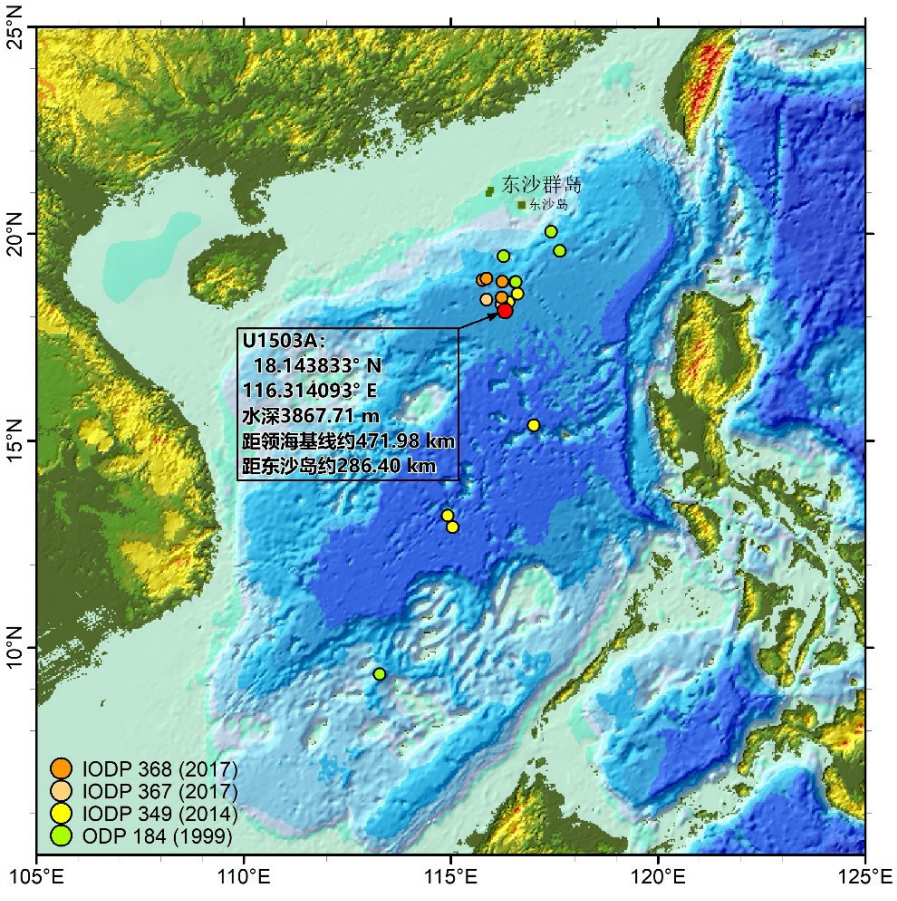
Shanghai Science Hall. Wang Pinxian, academician of the Chinese Academy of Sciences and professor at Tongji University, revealed at the meeting that China is striving to become the fourth platform provider for international ocean drilling and will organize its own expeditions, which indicates that China has become one at the forefront of marine research. Wang Pinxian also revealed that Chinese scientists are striving to hold an international conference in 2020 to discuss with the international scientists the development of a new decadal ocean drilling science plan.

南海捷报：南海最深钻井终于完成

South China Sea News: The deepest drilling hole in the South China Sea was finally completed

IODP 368X航次于2018年11月17日自中国香港起航，18日早到达U1503站位，19日找到U1503A井（18° 8.6300′ N, 116° 18.8456′ E）并成功放入再入锥。经过12天的连续钻进，11月30日在1597.75米井深处钻遇玄武岩，继续钻进113 m并取得超过110 m基底玄武岩岩芯后，至12月5日终孔时，U1503A井深达到1710.1 m，成为南海科学钻探的最深井，同时也成为国际大洋钻探50年历史上的第五深井。此番IODP 368 X航次的成功，为解开南海张裂及形成之谜提供重要依据，为南海洋壳年龄之争画上句号。

IODP Expedition 368X sailed from Hong Kong, China on November 17, 2018. It arrived at Site U1503 on the 18th, located the Hole U1503A (18° 8.6300’ N, 116° 18.8456’ E) and successfully placed in the reentry cone on the 19th. After 12 days of continuous drilling, basalt was met at the depth of 1597.75 meters on November 30, and after drilling 113 m and more than 110 m of basement basalt core was obtained. When the drilling completed on December 5, Hole U1503A reached a depth of 1710.1 m, and became the deepest hole in the South China Sea scientific drilling, and also the fifth deepest hole in the 50 years of international ocean drilling. The success of IODP Expedition 368X will provide an important basis for unlocking the mystery on the South China Sea opening and formation and on the age of the South China Sea oceanic crust.



深潜
DEEP DIVE



2018 年 5 月，中国三亚所“深海勇士”号执行南海深部计划的载人深潜航次

The "Deep Sea Warrior" vessel.

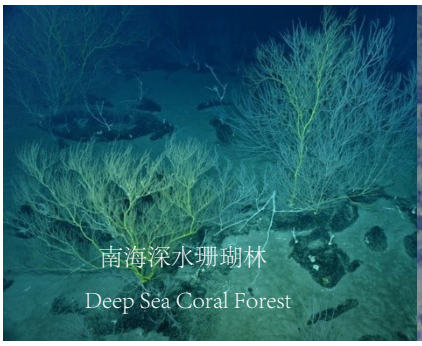
2018 年 5 月 13 日，“深海勇士”号迎来迄今年龄最大科学考察者

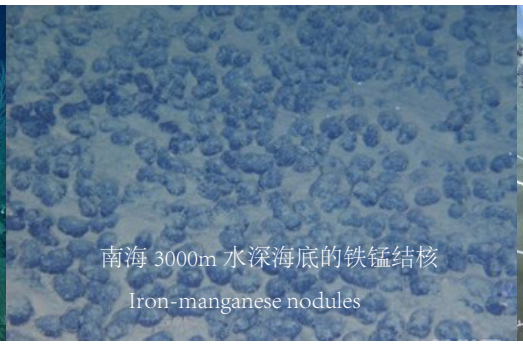
On May 13th, the Academician Wang Pin-xian took part in diving on the "Deep Sea Warrior" as the eldest passenger on board ever.

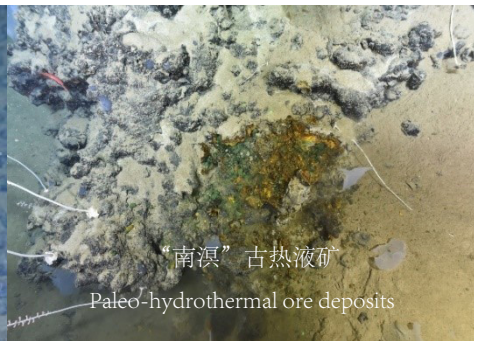
2018 年 4 月 16 日至 5 月 15 日，中国 - 加拿大合作南海遥控深潜航次

The Sina-Canada remote unmanned deep submersible launched in South China Sea.

南海深潜三大科学新发现
Three major scientific discoveries


南海深水珊瑚林
Deep Sea Coral Forest

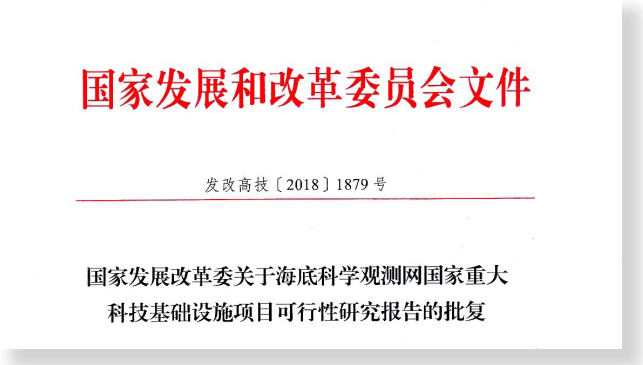

南海 3000m 水深海底的铁锰结核
Iron-manganese nodules


“南漠”古热液矿
Paleo-hydrothermal ore deposits

深网
DEEP OBSERVATORY

12 月 21 日 国家发展和改革委员会正式发文“关于海底科学观测网国家重大科技基础设施项目可行性研究报告的批复”。标志着由同济大学牵头的我国海底观测网正式步入开工建设阶段。

On December 21th, the National Development and Reform Commission issued a official letter "Reply on the Feasibility Study Report of the National Major Science and Technology Infrastructure Project of the Seabed Science Observing Network". It marks that China’s submarine observation network led by Tongji University is officially entering the construction phase.


国家发展和改革委员会文件

发改高技〔2018〕1879 号

国家发展改革委关于海底科学观测网国家重大科技基础设施项目可行性研究报告的批复

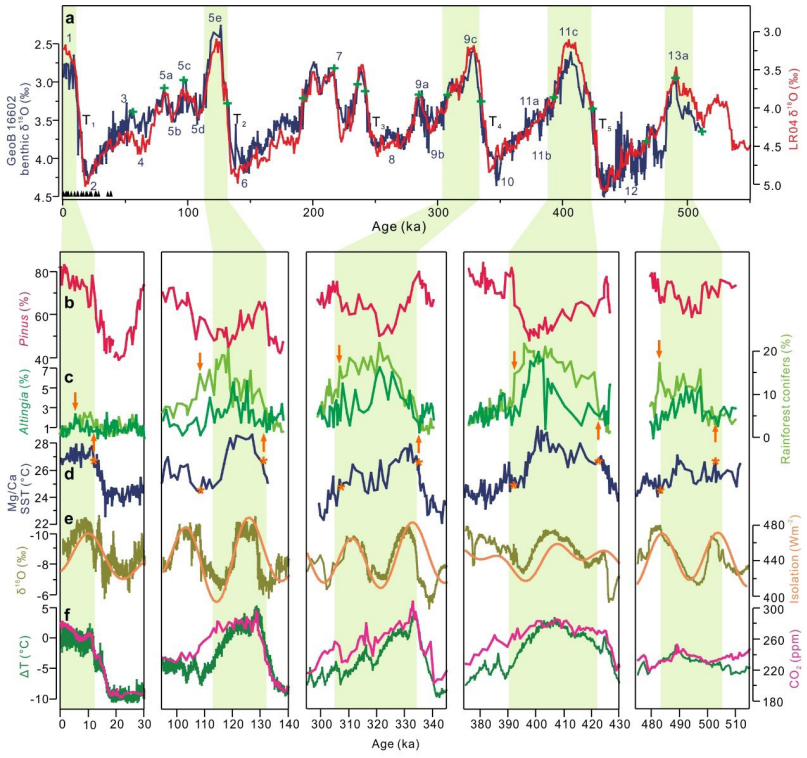
古海洋和古环境
Paleoceanography and Paleoenvironment

Anthropogenic modification of vegetated landscapes in southern China from 6,000 years ago

Cheng Z, Weng C, Steinke S, et al. Anthropogenic modification of vegetated landscapes in southern China from 6,000 years ago. Nature Geoscience, 2018, 11:939-943.

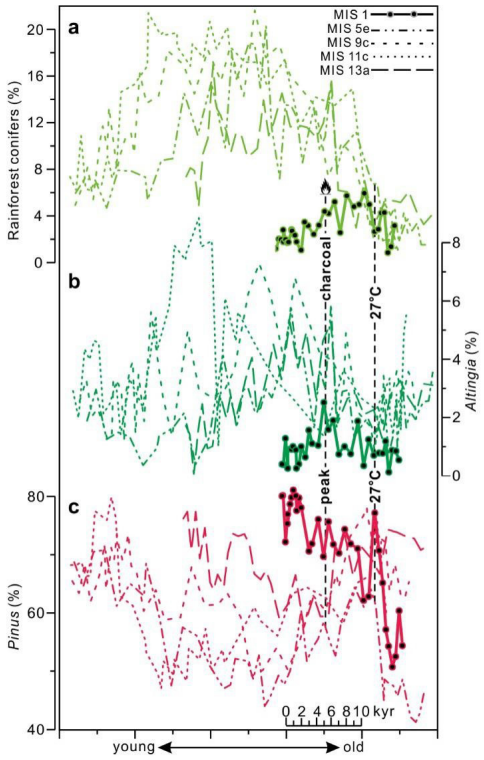
Abstract:

Vegetation dynamics during previous warm interglacial periods shed light on the human impacts on natural ecosystems during the Holocene. However, reliable terrestrial records that span such periods are rare and provide little information on regional scale. Here we present a high-resolution marine pollen record from the northern South China Sea, which reveals that during five peak interglacial periods, Marine Isotope Stages 13a, 11c, 9c, 5e and 1 (the Holocene), the vegetation successions in southern China were similar. At the beginning of each interglacial period, tropical rainforest conifers, which include Dacrydium, Dacrycarpus and Podocarpus, and associated broadleaved taxa, such as Altingia, expanded quickly at the expense of the subtropical/temperate montane conifer Pinus. Near the end of the warm periods, Pinus recovered and the tropical taxa retreated. However, the Holocene displays subtle but significant differences in which the species turnover was interrupted and the rainforest conifers did not fully expanded. The Mg/Ca-based sea surface temperature record from the same site reveals that temperature was the major control of the rise and fall of the peak interglacial vegetation. However, exceptionally high charcoal fluxes during the Holocene suggest that human activities through land-use modifications completely, and possibly permanently, altered the natural vegetation trend five to six thousand years ago.



Time series of vegetation and climate records during peak interglacials (light green bars).

a, Age control based on 18 ^{14}C dates (black triangles) and matching the benthic δ^{18}O curve with the LR04 stack (green crosses indicate the tie points). b,c, Pollen percentages of key participants in interglacial vegetation succession. d, Mg/Ca-based SST record. The orange arrows and stars indicate the rise and fall of interglacial vegetation and the corresponding temperatures. e, Composite Asian monsoon δ^{18}O record of Chinese stalagmites and 21 July insolation at 65° N. f, Antarctic temperature anomaly and CO_2 records from EPICA Dome C ice cores.



Abundance variations of the key plant taxa/group for peak interglacials. The pollen percentage data of different interglacials are aligned using the age of a common temperature threshold at each glacial termination, and are plotted against the uniform time-length unit. Note the overlap between the Holocene and previous interglacials at the initial stage, and the systematic deviation after the 5 – 6 ka charcoal peak in the sediment.

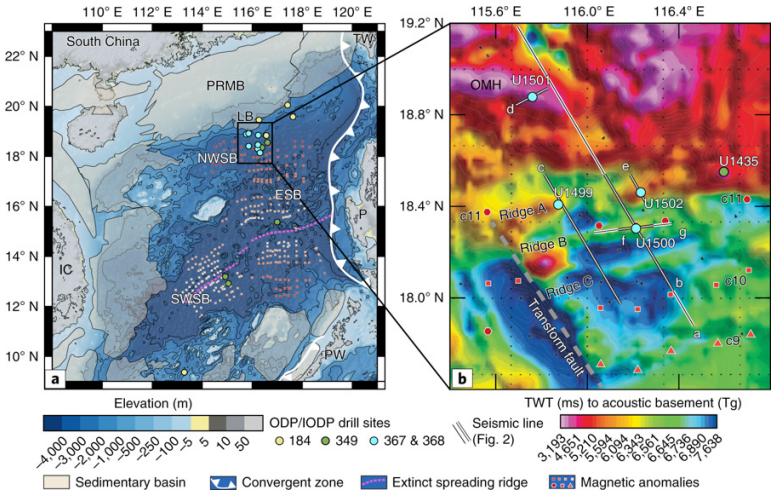
古海洋和古环境
Paleoceanography and Paleoenvironment

Rapid transition from continental breakup to igneous oceanic crust in the South China Sea

Larsen, H. C. and Stock, J. and Hinojosa, J. et al. Rapid transition from continental breakup to igneous oceanic crust in the South China Sea. Nature Geoscience, 2018, 11(10):782-789.

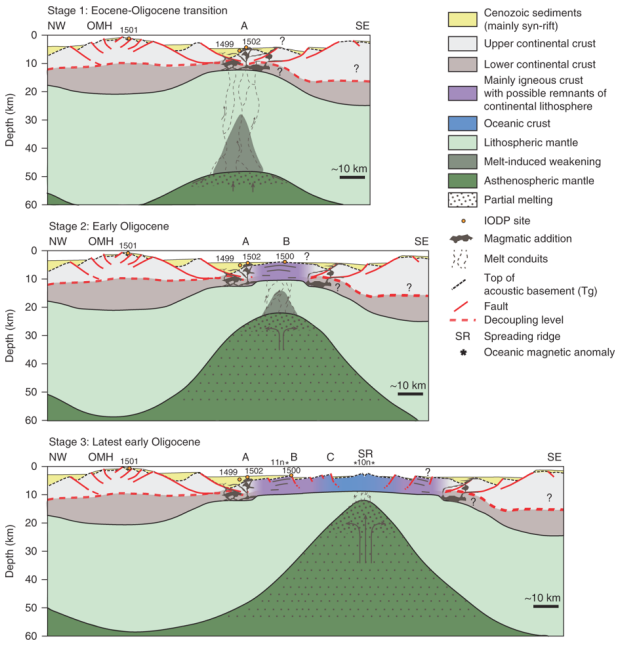
Abstract:

Continental breakup represents the successful process of rifting and thinning of the continental lithosphere, leading to plate rupture and initiation of oceanic crust formation. Magmatism during breakup seems to follow a path of either excessive, transient magmatism (magma-rich margins) or of igneous starvation (magma-poor margins). The latter type is characterized by extreme continental lithospheric extension and mantle exhumation prior to igneous oceanic crust formation. Discovery of magma-poor margins has raised fundamental questions about the onset of ocean-floor type magmatism, and has guided interpretation of seismic data across many rifted margins, including the highly extended northern South China Sea margin. Here we report International Ocean Discovery Program drilling data from the northern South China Sea margin, testing the magma-poor margin model outside the North Atlantic. Contrary to expectations, results show initiation of Mid-Ocean Ridge basalt type magmatism during breakup, with a narrow and rapid transition into igneous oceanic crust. Coring and seismic data suggest that fast lithospheric extension without mantle exhumation generated a margin structure between the two endmembers. Asthenospheric upwelling yielding Mid-Ocean Ridge basalt-type magmatism from normal-temperature mantle during final breakup is interpreted to reflect rapid rifting within thin pre-rift lithosphere.



Regional setting and key basement topography of study area.

a, Topographic map and major features of the SCS with the location of IODP/ODP sites. Sedimentary basins: Pearl River Mouth Basin (PRMB), Liwan Basin (LB). Ocean sub-basins: Eastern Sub-Basin (ESB), North West Sub-Basin (NWSB), South West Sub-Basin (SWSB). Continental domains: Indochina (IC), Palawan (PW), Philippines (P), Taiwan (TW). b, Depth to acoustic basement (Tg) presented with the seismic lines used in Fig. 2 and indication of distinct topographic features: Outer Margin High (OMH) and Ridges A, B and C. Note the presence of a transform fault west of the margin segment being investigated. For both maps, picking of magnetic anomalies are after refs with the geomagnetic timescale of ref. Gridded magnetic data are provided in refs.



Conceptual model of continental breakup based on integration of seismic and drilling data from Figs. 2 and 3. Stage 1: a deep basin with thin crust existed within the final zone of plate rupture and hosted magmatism at the Eocene – Oligocene transition, based on Site U1502 findings. Stage 2: ascending melts rapidly weakened the mantle lithosphere, and massive extrusive activity along the entire rift zone took place, underpinned by a thicker zone of melting in the asthenosphere. Stage 3: seafloor spreading and passive upwelling of asthenospheric mantle was established. Igneous basement of Ridges B and C was affected by normal faults. Note that, in time, stages 2 and 3 are ~1 Myr apart (or less), but a high rate (~2.5 cm yr^{-1}, half-rate) of plate separation translates to significant distance in space. The area of possible transient crust around Ridge B is shown in purple. Constraints on the southern conjugate margin (Palawan) structure are limited to seismic data of moderate quality and only schematically represented. However, both the timing of rifting at the distal margin and the width of the zone of main crustal necking are similar on both margins.

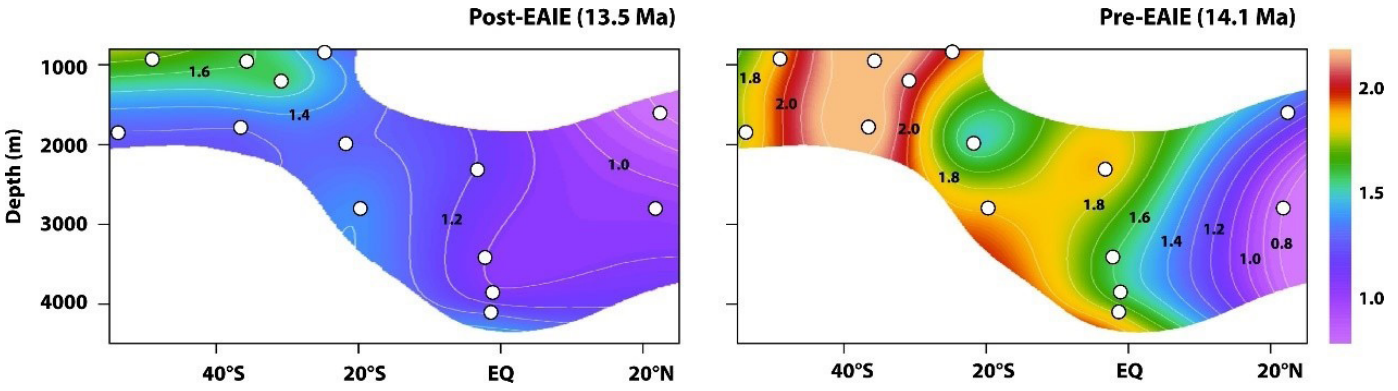
古海洋和古环境
Paleoceanography and Paleoenvironment

Changes of deep Pacific overturning circulation and carbonate chemistry during middle Miocene East Antarctic ice sheet expansion

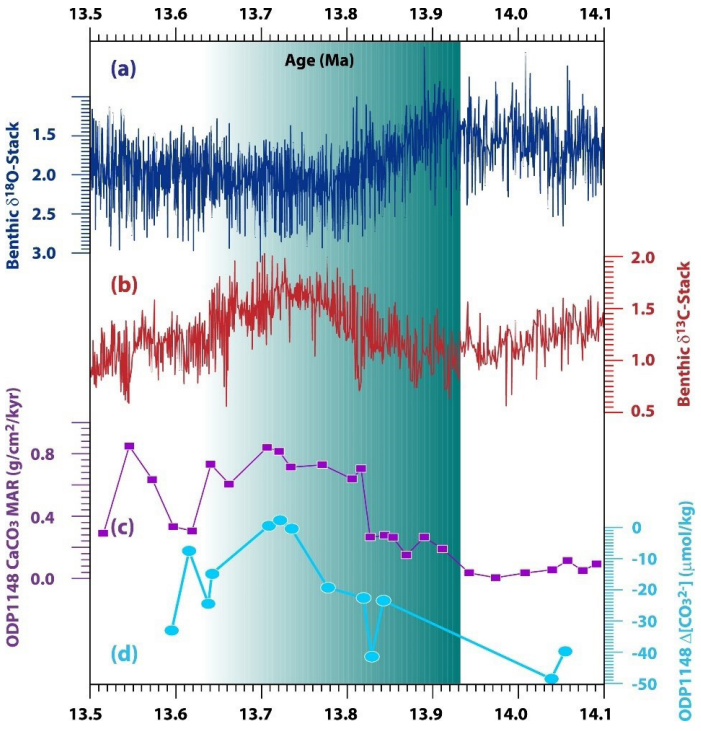
Ma X, Tian J, Ma W, et al. Changes of deep Pacific overturning circulation and carbonate chemistry during middle Miocene East Antarctic ice sheet expansion. Earth and Planetary Science Letters, 2018, 484:253-263.

Abstract:

East Antarctic ice sheet expansion (EAIE) at ~13.9 Ma in the middle Miocene represents a major climatic event during the long-term Cenozoic cooling, but ocean circulation and carbon cycle changes during this event remain unclear. Here, we present new fish teeth isotope (ε Nd) and benthic foraminiferal B/Ca records from the South China Sea (SCS), newly integrated meridional Pacific benthic foraminiferal δ ^{18}O and δ ^{13}C records and simulated results from a biogeochemical box model to explore the responses of deep Pacific Ocean circulation and carbon cycle across EAIE. The ε Nd and meridional benthic δ ^{13}C records reveal a more isolated Pacific Deep Water (PDW) and a sluggish Pacific meridional overturning circulation during the post-EAIE with respect to the pre-EAIE owing to weakened southern-sourced deep water formation. The deep-water [CO_{32}-] and calcium carbonate mass accumulation rate in the SCS display markedly similar increases followed by recoveries to the pre-EAIE level during EAIE, which were probably caused by a shelf – basin shift of $CaCO_3$ deposition and strengthened weathering due to a sea level fall within EAIE. The model results show that the ~1‰ positive δ ^{13}C excursion during EAIE could be attributed to increased weathering of high- δ ^{13}C shelf carbonates and a terrestrial carbon reservoir expansion. The drawdown of atmospheric CO_2 over the middle Miocene were probably caused by combined effects of increased shelf carbonate weathering, expanded land biosphere carbon storage and a sluggish deep Pacific meridional overturning circulation.



Pacific meridional distribution of benthic δ ^{13}C for (a) post-EAIE and (b) pre-EAIE, profile (a) and (b) are generated using ODV.



Stacked (a) benthic δ ^{18}O and (b) δ ^{13}C records for Lower Circumpolar Deep Water. (c) $CaCO_3$ mass accumulation rate (MAR) at ODP Site 1148 (Li et al., 2006), and (d) reconstructed Δ [CO_{32+}] derived from C. wuellerstorfi or C. mundulus B/Ca ratio at ODP Site 1148.

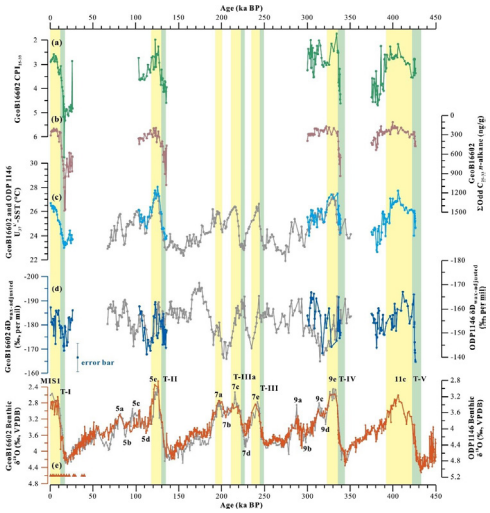
古海洋和古环境
Paleoceanography and Paleoenvironment

Precession and glacial–cycle controls of monsoon precipitation isotope changes over East Asia during the Pleistocene

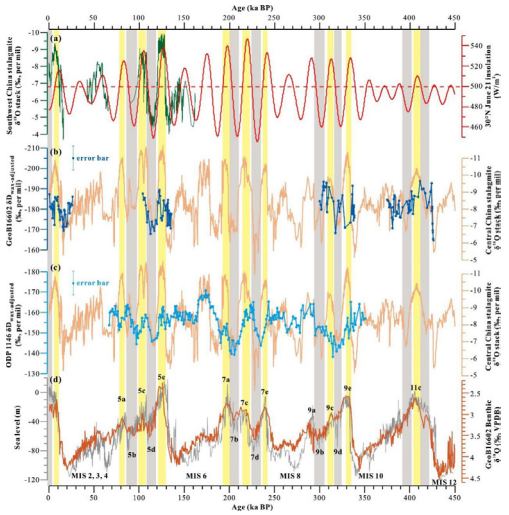
Huang E, Chen Y, Schefuß E, et al. Precession and glacial-cycle controls of monsoon precipitation isotope changes over East Asia during the Pleistocene. Earth and Planetary Science Letters, 2018, 494:1-11.

Abstract:

Precipitation isotope reconstructions derived from speleothems and plant waxes are important archives for understanding hydroclimate dynamics. Their climatic significance in East Asia, however, remains controversial. Here we present terrestrial plant-wax stable hydrogen isotope (δ Dwax) records over periods covering the last four interglacials and glacial terminations from sediment cores recovered from the northern South China Sea (SCS) as an archive of regionally-integrated precipitation isotope changes in Southeast China. Combined with previous precipitation isotope reconstructions from China, we find that the SCS δ Dwax and Southwest-Central China stalagmite $\delta^{18}O$ records show relatively enriched and depleted isotopic values, respectively, during interglacial peaks; but relatively similar isotopic variations during most sub-interglacials and glacial periods over the past 430 thousand years. During interglacial peaks, strong summer insolation should have intensified the convection intensity, the isotopic fractionation along moisture trajectories and the seasonality, which are all in favor of causing isotopically-depleted rainfall over the East Asian monsoon regime. These effects in combination with a relatively high proportion of Indian Ocean- versus Pacific-sourced moisture influx should have resulted in strongly depleted precipitation isotopes (stalagmite $\delta^{18}O$) over most parts of China. However, Southeast China should have been affected by a relatively low ratio of Indian Ocean- versus Pacific-sourced moisture influx, which dominated over effects yielding depleted precipitation isotopes and led to enriched precipitation isotopes (δ Dwax). It is thus concluded that glacial boundary conditions and insolation forcing are the two most important factors for causing regional differences in precipitation isotope compositions over subtropical East Asia on orbital timescales.



Age models and biomarker records of GeoB16602 (a – e, color) and ODP Site 1146 (c – e, gray, Thomas et al., 2014). Triangles represent AMS 14C dating for Site GeoB16602 (Liu et al., 2017). All δ Dwax results were adjusted for changes in seawater isotope composition and temperature. The error bar in (d) indicates the typical ±1 σ propagated standard error for the estimate of δ Dwax-adjusted. Note that different biomarkers have been analyzed at these two sites (ODP Site 1146: fatty acids; GeoB16602: n-alkane), and their δ Dwax values therefore show systematic offsets. Yellow and green bars indicate durations of interglacial peaks and glacial terminations, respectively.

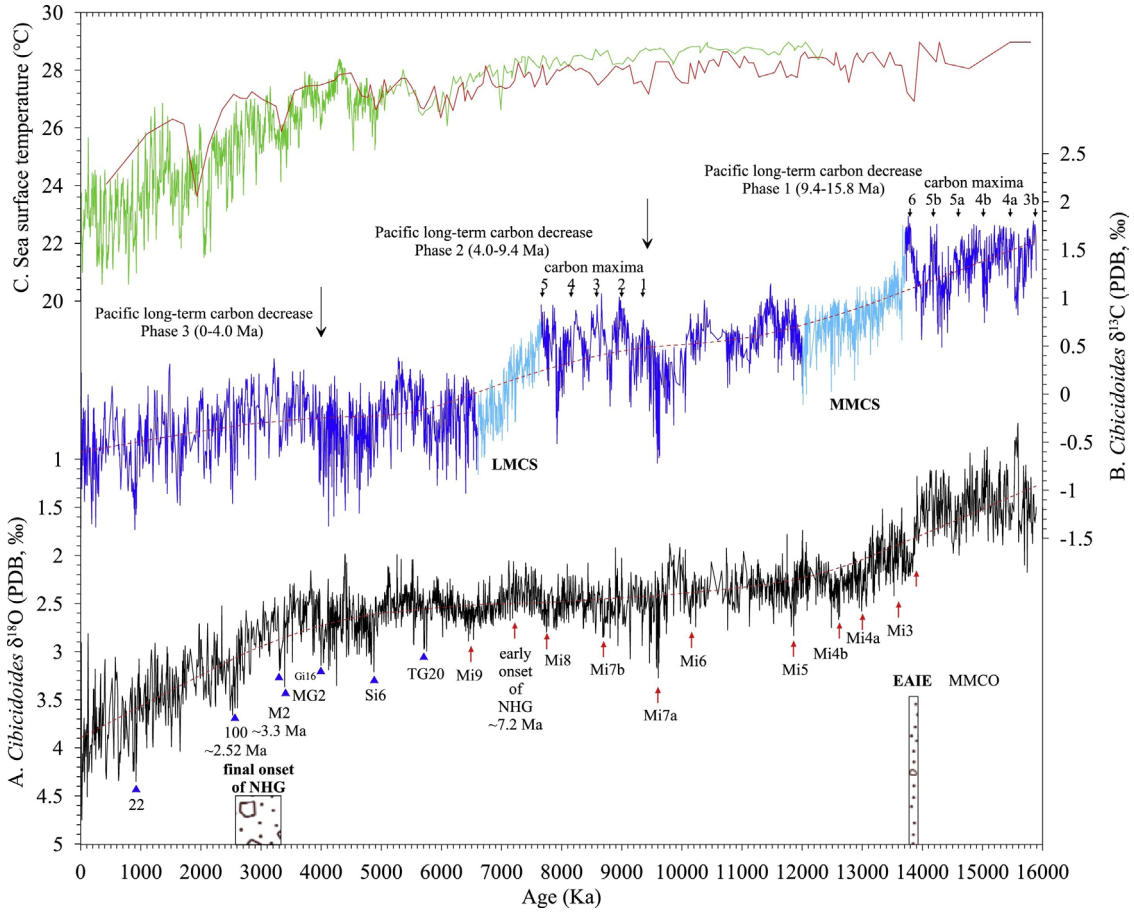


Comparison of the SCS δ Dwax records (blue, b: this study, c: Thomas et al., 2014) with NH summer insolation (red in a) (Berger, 1978), Southwest (green in a, Yuan et al., 2004, Dykoski et al., 2005, Kelly et al., 2006) and Central China stalagmite $\delta^{18}O$ (light red in b – c, compiled by Wang et al., 2008; Cheng et al., 2009, 2016), and benthic foraminiferal $\delta^{18}O$ stratigraphy of Site GeoB16602 (orange in d) as well as the sea-level reconstruction (gray in d, Grant et al., 2014) over the past 450 thousand years. All precipitation isotope records were adjusted for changes in seawater isotope composition and temperature. The error bar in (b) and (c) indicates the typical propagated ±1 σ standard error for the estimate of δ Dwax-adjusted. The dashed line in (a) indicates the separation of strong NH summer insolation from weak insolation. Grey bars indicate periods when NH summer insolation minima coincided with sub-interglacials, while yellow bars indicate large differences between Chinese stalagmite $\delta^{18}O$ and the SCS δ Dwax at NH summer insolation maxima.

古海洋和古环境
Paleoceanography and Paleoenvironment

Paleoceanography of the east equatorial Pacific over the past 16 Myr and Pacific–Atlantic comparison: High resolution benthic foraminiferal $\delta^{18}O$ and $\delta^{13}C$ records at IODP Site U1337

Tian J, Ma X. et al. Paleoceanography of the east equatorial Pacific over the past 16 Myr and Pacific − Atlantic comparison: High resolution benthic foraminiferal, $\delta^{18}O$ and, $\delta^{13}C$ records at IODP Site U1337. Earth and Planetary Science Letters, 2018, 499:185-196.



A. Benthic foraminiferal $\delta^{18}O$ of Site U1337; B. Benthic foraminiferal $\delta^{13}C$ of Site U1337; C. $U_{37}^{k'}$ derived sea surface temperature record of ODP Site 846 (green) (Herbert et al., 2016, Lawrence et al., 2006, Liu and Herbert, 2004) and IODP Site U1338 (red) (Rousselle et al., 2013). The red lines in A and B denote 30% weighted mean of the isotopic records. The red arrows and blue triangles in A denote the Miocene glaciation events and the Marine Isotope Stages (MISs) respectively. The sky blue lines in B denote MMCS (middle Miocene carbon shift) and LMCS (late Miocene carbon shift). The short black arrows in B denote carbon maxima events. The long black arrows separate the phases of the Pacific long-term ocean carbon isotope decrease. NHG, northern hemisphere glaciation. EAIE, east Antarctic ice sheet expansion. MMCO, middle Miocene carbon optimum.

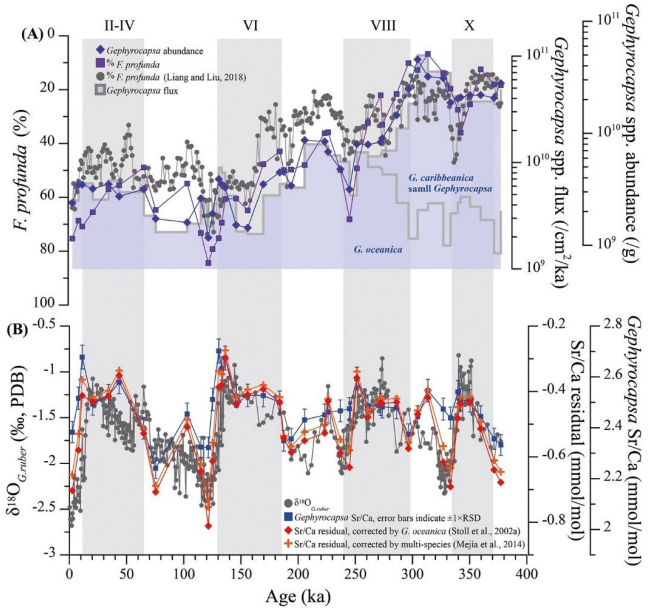
古海洋和古环境
Paleoceanography and Paleoenvironment

Evolutionary driven of Gephyrocapsa coccolith isotopic vital effects over the past 400 ka.

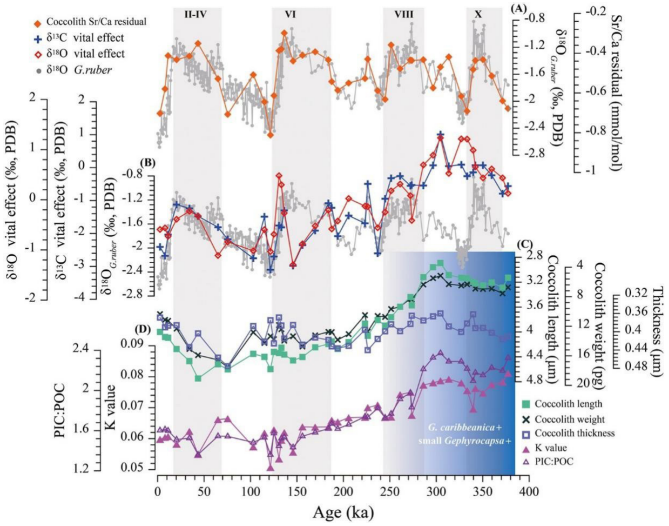
Jin X, Liu C, Zhang H. et al. Evolutionary driven of Gephyrocapsa coccolith isotopic vital effects over the past 400 ka. Earth and Planetary Science Letters, 2018, 503: 236-247.

Abstract:

Coccolithophores play important roles in marine biochemistry due to the processes of calcification and photosynthesis. Coccoliths are produced intracellularly, and cells produce coccoliths with stable isotopes distinct from theoretically precipitated inorganic calcite due to the influences of coccolithophore physiology, which are the so-called vital effects. The coccolith isotopic vital effects show large variations between species and hamper the use of coccolith isotopes in paleoceanography. In addition, learning the coccolith isotopic vital effects can help to better understand the carbon fractionation in coccolithophore cell, so as to provide a new insight in reconstructing sea water carbonate system (e.g., from alkenone $\delta^{13}C$ or directly from coccolith $\delta^{13}C$) in geological past. In the present study, we investigated the morphological parameters, growth rate, and coccolith stable isotope compositions of Gephyrocapsa, the most universal alkenone-producing coccolithophore across the Pleistocene. These data allow us to estimate the influences of Gephyrocapsa morphology as well as the growth rate on coccolith vital effects. The results showed that Gephyrocapsa morphology, as well as coccolith isotopes, varied with species and morphotype changes, which were evolutionarily forced over the past 400 ka. The small Gephyrocapsa morphotypes (G. caribbeanica and Gephyrocapsa <3 μm) produced more robust coccoliths with relatively heavier isotopes for both carbon and oxygen than that of the larger-sized G. oceanica. The carbon and oxygen vital effects were significantly correlated and showed negative values, suggesting a kinetic effect on bicarbonate formation during calcification. The Gephyrocapsa growth rate showed a glacial – interglacial cyclicality, and had close relations with coccolith isotopic vital effects before MIS 8 when G. oceanica dominated. It is suggested that coccolith isotopic fractionation were influenced by coccolithophore growth rate, however these effects were superimposed on an evolutionary forced coccolithophore (coccolith) size changes.



(A) Comparisons of coccolithophore productivity indices: Gephyrocapsaabundance (diamonds), relative abundance of F. profunda (squares, this study; dots, from SYRACO, Liang and Liu, 2018), and Gephyrocapsa flux in KX21-2. (B) Comparisons of G. ruber $\delta^{18}O$ (Zhou et al., 2011), Gephyrocapsa coccolith Sr/Ca (squares), and Sr/Ca residuals corrected by different temperature curves (diamonds: corrected by G. oceanica, Stoll et al., 2002; crosses: corrected by multi-species, Mejía et al., 2014). Errors bars in coccolith Sr/Ca denote one relative standard deviation (RSD). Replicate measurements on a standard sample indicate an RSD of 1.72% for Sr/Ca.



Comparisons of (A) G. ruber $\delta^{18}O$ (Zhou et al., 2011) and Gephyrocapsa coccolith Sr/Ca residual corrected by G. oceanica; (B) G. ruber $\delta^{18}O$ and Gephyrocapsa coccolith carbon and oxygen isotopic vital effects; (C) Mean Gephyrocapsa coccolith length, coccolith weight, and coccolith thickness in KX21-2 over the 400 ka; (D) The Gephyrocapsa coccolith k value (Young and Ziveri, 2000) and estimated particulate inorganic/organic carbon ratio (PIC:POC).

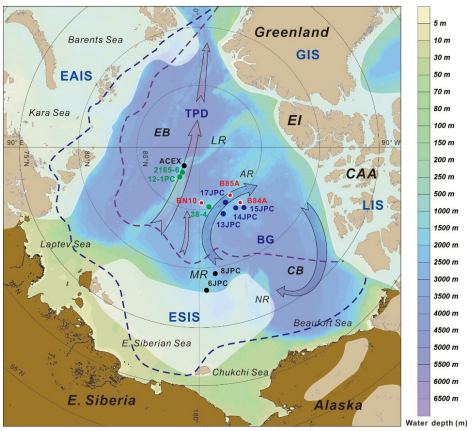
古海洋和古环境
Paleoceanography and Paleoenvironment

Late–Middle Quaternary lithostratigraphy and sedimentation patterns on the Alpha Ridge, central Arctic Ocean: implications for Arctic climate variability on orbital time scales

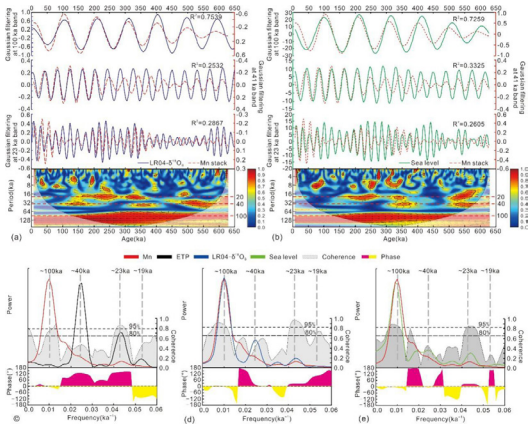
Wang R, Polyak L, Xiao W, et al. Late-Middle Quaternary lithostratigraphy and sedimentation patterns on the Alpha Ridge, central Arctic Ocean: Implications for Arctic climate variability on orbital time scales. Quaternary Science Reviews, 2018, 181:93-108.

Abstract:

We use sediment cores collected by the Chinese National Arctic Research Expeditions from the Alpha Ridge to advance Quaternary stratigraphy and paleoceanographic reconstructions for the Arctic Ocean. Our cores show a good litho/biostratigraphic correlation to sedimentary records developed earlier for the central Arctic Ocean, suggesting a recovered stratigraphic range of ca. 0.6 Ma, suitable for paleoclimatic studies on orbital time scales. This stratigraphy was tested by correlating the stacked Alpha Ridge record of bulk XRF manganese, calcium and zirconium (Mn, Ca, Zr), to global stable-isotope (LR04- $\delta^{18}O$) and sea-level stacks and tuning to orbital parameters. Correlation results corroborate the applicability of presumed climate/sea-level controlled Mn variations in the Arctic Ocean for orbital tuning. This approach enables better understanding of the global and orbital controls on the Arctic climate. Orbital tuning experiments for our records indicate strong eccentricity (100-kyr) and precession (~20-kyr) controls on the Arctic Ocean, probably implemented via glaciations and sea ice. Provenance proxies like Ca and Zr are shown to be unsuitable as orbital tuning tools, but useful as indicators of glacial/deglacial processes and circulation patterns in the Arctic Ocean. Their variations suggest an overall long-term persistence of the Beaufort Gyre circulation in the Alpha Ridge region. Some glacial intervals, e.g., MIS 6 and 4/3, are predominated by material presumably transported by the Transpolar Drift. These circulation shifts likely indicate major changes in the Arctic climatic regime, which yet need to be investigated. Overall, our results demonstrate applicability of XRF data to paleoclimatic studies of the Arctic Ocean.



Location map with major Arctic Ocean sea-floor and oceanographic features. Different sybmols show sediment cores analyzed for this study (red circles with white outline), used for augmenting the XRF data (blue circles) or for regional correlation (green circles), and other cores mentioned in the paper (black circles) (see Table 1 for more core information). Light shaded areas indicate tentative extent of Pleistocene glaciationsaround the Arctic Ocean (from Niessen et al., 2013, Jakobsson et al., 2016). Dark blue and purple dashed lines indicate climatological average (1979 – 2006) and recent minimum (2012) September sea ice extent, respectively (Parkinson and Cavalieri, 2008; www.nsidc.org). LR: Lomonosov Ridge; MR: Mendeleev Ridge; AR: Alpha Ridge; NR: Northwind Ridge; EB – Eurasian Basin; CB – Canada Basin; CAA: Canadian Arctic Archipelago; EI – Ellesmere Island; BG: Beaufort Gyre; TPD: Transpolar Drift; EAIS: Eurasian Ice Sheet; GIS: Greenland Ice Sheet; LIS: Laurentide Ice Sheet; ESIS: East Siberian Ice Sheet.



Analysis of the coherency between SMn and the LR04- $\delta^{18}O$ (Lisiecki and Raymo, 2005) and sea level curve (Rohling et al., 2014). (a – b) Fourier band-pass filtered SMn and LR04- $\delta^{18}O$ and sea level on the three major orbital cycles centered at ~100 kyr, ~41 kyr and ~23 kyr. Determination coefficients (r2) are shown on each subplot. Cross wavelet coherency (WTC) (Grinsted et al., 2004) between SMn and the LR04- $\delta^{18}O$ and sea level on the three major orbital cycles distributed at time sequence. The thick black contour on the cross wavelet maps shows the 5% significance level against red noise. The cone of influence (COI), where edge effects might distort the picture, is shown as a lighter shade. Arrows in the picture represent phase deviations between SMn and the LR04- $\delta^{18}O$ and sea level. Upward and downward arrows show leading and lagging SMn, respectively. The three pink punctured lines through the cross wavelet maps denote the band centers of the 100-kyr, the 41-kyr and the 23-kyr orbital cycles. (c – e) Cross spectral correlation of SMn versus the LR04- $\delta^{18}O$, sea level curve, and ETP (eccentricity + tilt + precession) (Laskar et al., 2004). The 95% coherences on the 100-kyr and 23-kyr orbital cycles indicate high correlation between SMn and the LR04- $\delta^{18}O$, sea level, and ETP.

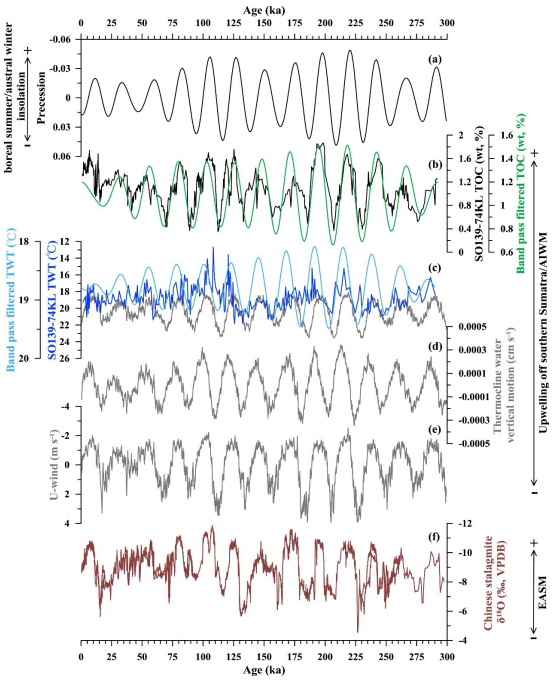
古海洋和古环境
Paleoceanography and Paleoenvironment

Precession–paced thermocline water temperature changes in response to upwelling conditions off southern Sumatra over the past 300,000 year

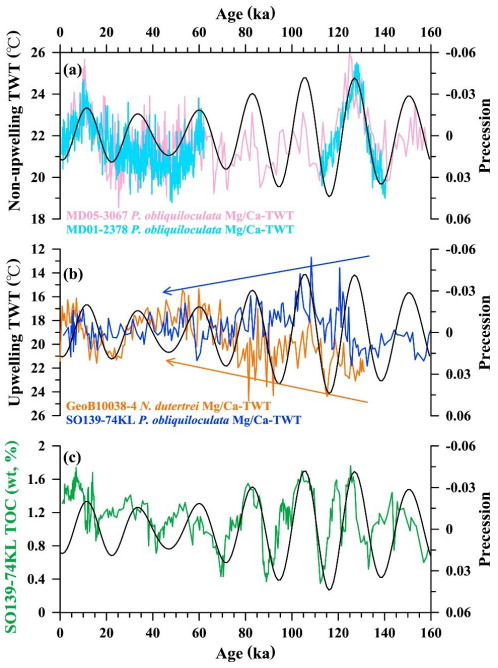
Wang X, Jian Z, L ü ckge A. et al. Precession-paced thermocline water temperature changes in response to upwelling conditions off southern Sumatra over the past 300,000 years. Quaternary Science Reviews, 2018, 192: 123-134.

Abstract:

Modern variations of sea surface temperature (SST) and thermocline water temperature (TWT) off southern Sumatra are responding to local upwelling conditions which are controlled by the Australian-Indonesian winter monsoon. The relationships between SST, TWT and upwelling during the past glacial-interglacial cycles are less clearly understood. In this study, SST and TWT variabilities over the past 300 kyr are reconstructed by using foraminiferal Mg/Ca-paleothermometry in sediment core SO139-74 KL off southern Sumatra (6° 32.6′ S, 103° 50′ E; 1690 m water depth). Whereas SST shows a clear glacial-interglacial cycle, TWT displays a predominant cycle at the precession band. Generally, the TWT record varies with total organic carbon content, revealing that similar to today, TWT and upwelling intensity off southern Sumatra vary in concert during the past 300 kyr. The lack of glacial-interglacial variability in the TWT suggests a limited role of glacial boundary conditions, such as changing sea level and ice volume, on the upwelling intensity in this region. The vertical gradients of upper water $\delta^{18}O$ and temperature at this site also reveal precessional cyclicity. Our model simulation of air-sea interaction further supports the low TWTs during periods of enhanced upwelling and precession minimum.



Comparison of the SO139-74 KL upwelling records with other paleoclimaterecords over the past 300 kyr. (a) Precession parameter (Berger and Loutre, 1991); (b) TOC (black line) and band pass filtered TOC (green line) of core SO139-74 KL (L ü ckge et al., 2009); (c) Mg/Ca-derived TWT (blue line), band pass filtered TWT (light blue line) of core SO139-74 KL and simulated TWT off southern Sumatra (gray line); (d) simulated thermocline water vertical velocity anomaly off southern Sumatra; (e) simulated low-level zonal (850 hPa U-wind) wind speed anomaly; (f) Chinese stalagmite $\delta^{18}O$ records from the Hulu, the Sanbao and the Linzhu Caves (Cheng et al., 2009; Wang et al., 2008, 2001). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)



Comparison of the TWT records across the IPWP and the TOC record of core SO139-74 KL: (a) TWT records derived from P. obliquiloculata Mg/Ca ratios in the IPWP non-upwelling region: core MD01-2378 (sky blue line, Xu et al., 2008, 2006; Zuraida et al., 2009) and core MD06-3067 (pink line, Bolliet et al., 2011); (b) TWT records derived from N. dutertrei Mg/Ca ratios of core GeoB10038-4 (orange line, Mohtadi et al., 2010) and P. obliquiloculata Mg/Ca ratios of core SO139-74 KL (blue line, this study) off southern Sumatra upwelling region; (c) TOC of core SO139-74 KL (L ü ckge et al., 2009). The superimposed black lines represent precession parameter (Berger and Loutre, 1991). Note that Y-axis for upwelling region TWT is reversed. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

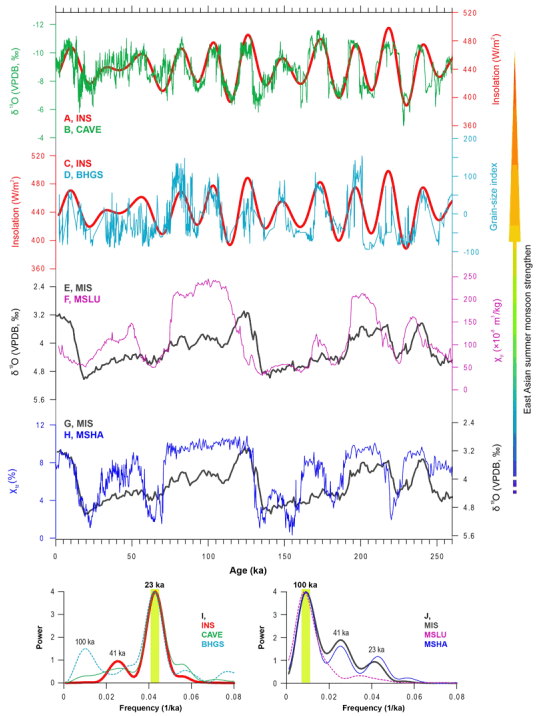
古海洋和古环境
Paleoceanography and Paleoenvironment

Orbital–scale nonlinear response of East Asian summer monsoon to its potential driving forces in the late Quaternary

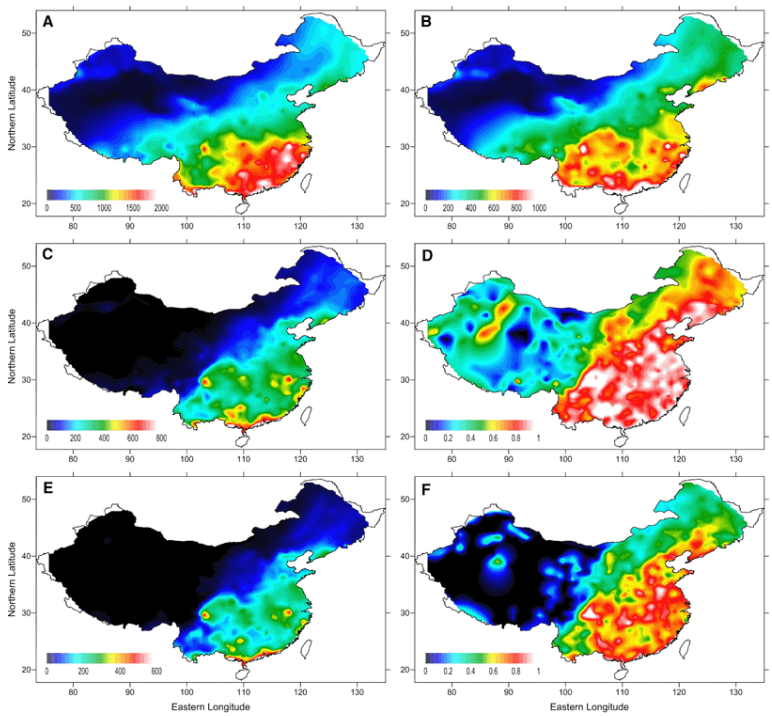
Yi L, Shi Z, Tan L, et al. Orbital-scale nonlinear response of East Asian summer monsoon to its potential driving forces in the late Quaternary. Climate Dynamics, 2018, 50:1-15.

Abstract:

We conducted a statistical study to characterize the nonlinear response of the East Asian summer monsoon (EASM) to its potential forcing factors over the last 260 ka on orbital timescales. We find that both variation in solar insolation and global ice volume were responsible for the nonlinear forcing of orbital-scale monsoonal variations, accounting for ~80% of the total variance. Specifically, EASM records with dominated precession variance exhibit a more sensitive response to changes in solar insolation during intervals of enhanced monsoon strength, but are less sensitive during intervals of reduced monsoon strength. In the case of global ice volume with 100-ka variance, this difference is not one of sensitivity but rather a difference in baseline conditions, such as the relative areas of land and sea which affected the land – sea thermal gradient. We therefore suggest that EASM records with dominated precession variance recorded the signal of a shift in the location of the Inter-tropical Convergence Zone, and the associated changes in the incidence of torrential rainfall; while for proxies with dominated 100-ka variance, it recorded changes in the land – sea thermal gradient via its effects on non-torrential precipitation.



EASM proxies and their forcing factors. a, c 21 July insolation at 65° N (INS, Berger and Loutre 1991). b Stalagmite $\delta^{18}O$ series (CAVE, Cheng et al. 2016). d Sediment grain-size record from the Bohai Sea (BHGS, Yi et al. 2012). e, g Deep-sea sediment $\delta^{18}O$ records (MIS, Lisiecki and Raymo 2005). f, h Magnetic susceptibility record of the Luochuan (MSLU, low frequency data, Lu and An 1997) and Yimaguan profiles (MSHA, frequency-dependent data, Hao et al. 2012), respectively, from the loess – paleosol sequence of the Chinese loess plateau. i, j Spectral comparison between each paired dataset, following the Blackman – Tukey method (Howell et al. 2006) implemented with the ARAND software package



Distribution of torrential rainfall over mainland China. a Annual rainfall (mm), b summer (JJAS) rainfall (mm), c, e torrential rainfall in summer (mm), ⩾ 30 and 50 mm/day, respectively; d, f variance ratio of torrential rainfall and total summer rainfall. Daily rainfall data (1951 – 2004) are from the China Meteorological Administration.

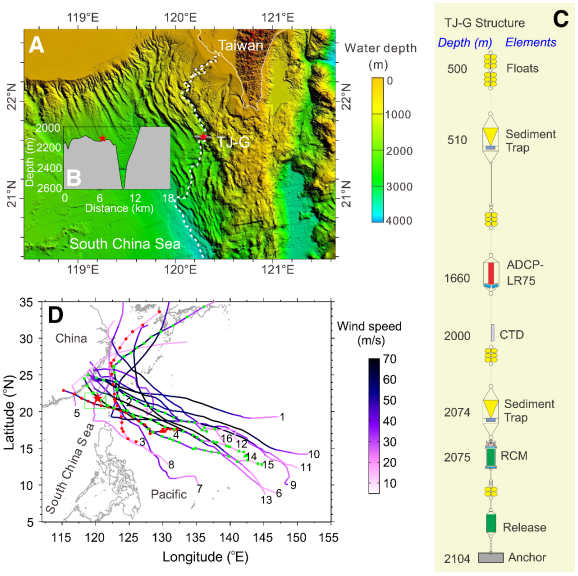
海洋沉积
Marine Sedimentology

Long-term in situ observations on typhoon-triggered turbidity currents in the deep sea

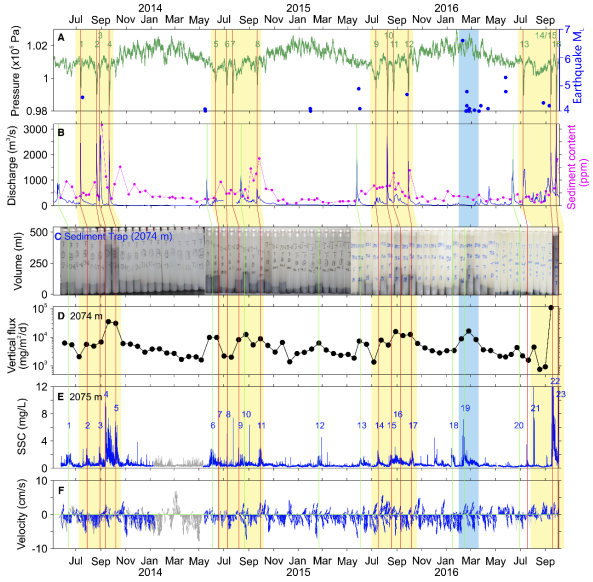
Zhang Y, Liu Z, Zhao Y. et al. Long-term in situ observations on typhoon-triggered turbidity currents in the deep sea. Geology, 2018, 46(8): 675-678.

Abstract:

Turbidity currents regulate the transport of terrigenous sediment, abundant in carbon and nutrients, from the shelf to the deep sea. However, triggers of deep-sea turbidity currents are diverse and remain debatable in individual cases due to few direct measurements and unpredictable occurrence. Here we present long-term monitoring of turbidity currents at a water depth of 2104 m on the margin of the Gaoping Submarine Canyon off Taiwan, which has the world's highest erosion rates and wettest typhoons. The unique 3.5 year record of in situ observations demonstrates the frequent occurrence of deep-sea turbidity currents (an average of six times per year from May 2013 to October 2016), most of which show enhanced sediment flux, raised temperature, and lowered salinity. They are attributed to elevated discharge of the Gaoping River due to typhoons traversing Taiwan. The total duration of these prolonged turbidity currents amounts to 30% of the entire monitoring period, contributing to ~72% of total sediment transport in the lower canyon. Our study demonstrates for the first time that typhoons are the most important triggers, in the long term, of frequent turbidity currents and enhanced sediment delivery into the deep sea in the typhoon-river-canyon environment.



Mooring system in the Gaoping Submarine Canyon, offshore Taiwan. A: Bathymetry of study area. Dashed white line shows canyon thalweg, gray line shows cross section in B; red star is mooring position. B: Cross-canyon profile showing mooring (red star) located on the levee. C: Vertical structure of the TJ-G mooring. D: Tracks of 16 typhoons that influenced the study area between 2013 and 2016. Green dotted lines show three super-typhoons in September 2016 (marked as numbers 14, 15, and 16). Green box shows the area in A; red star is mooring.



Timing and triggers of turbidity currents. A: Sixteen typhoons (labeled with green numbers) accompanied by low atmospheric pressure, with earthquakes of ML > 4 shown as blue dots. B: Daily river discharge (blue line) at Gaoping River mouth (Taiwan), with sediment content (pink line). C: Bottled sediment samples collected by the lower trap ~30 m above seafloor. D: Vertical sediment flux calculated from sediment samples shown in C. E: Suspended sediment concentration (SSC, blue line) inferred from a recording current meter (RCM) at 2075 m (~29 m above seafloor). Due to a RCM malfunction, data for January and May 2014 (gray line) are calculated from acoustic Doppler current profiler (ADCP) echo intensity at ~2000 m. Labeled numbers show turbidity currents with SSC > 0.5 mg/L. F: Same as E, but for current velocity with tides removed at 2075 m. Red lines from top to bottom in A – F connect typhoons (accompanied with peak river discharge) and associated deep-sea turbidity currents. Green lines in B – F connect peak river discharge and related turbidity currents in the absence of typhoons. Yellow shaded regions indicate typhoon seasons. Blue shaded region shows ML = 6.5 Kaohsiung earthquake followed by a swarm of ML = 4 – 5 aftershocks.

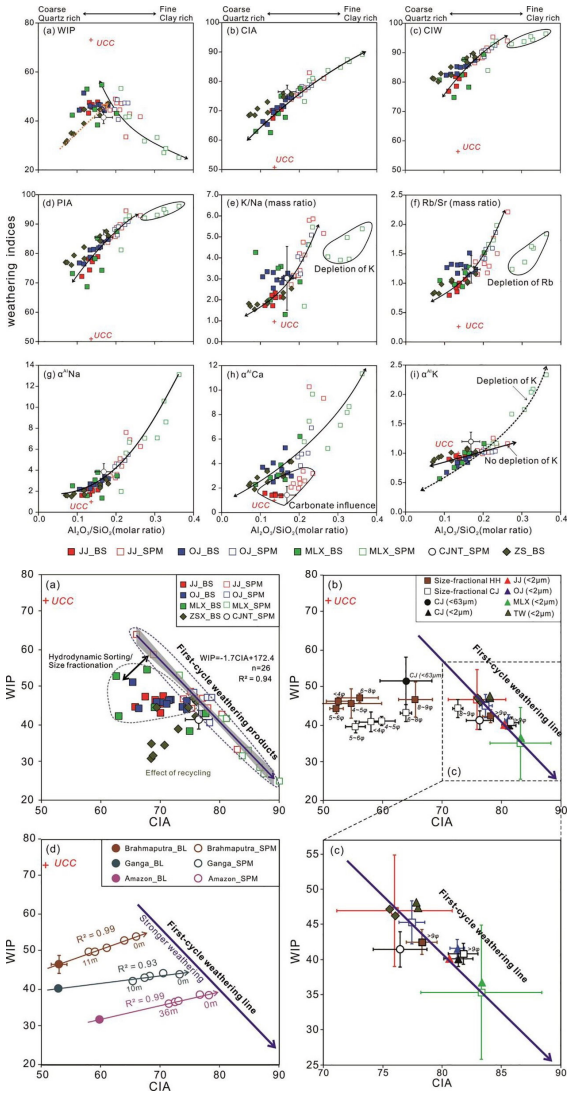
海洋沉积
Marine Sedimentology

Revisiting the effects of hydrodynamic sorting and sedimentary recycling on chemical weathering indices

Guo Y , Yang S , Su N , et al. Revisiting the effects of hydrodynamic sorting and sedimentary recycling on chemical weathering indices. Geochimica et Cosmochimica Acta, 2018, 227:48-63.

Abstract:

Although the proxies based on elemental geochemistry of siliciclastic sediments have been well developed to indicate the intensity of chemical weathering in various catchments, their geological indications and limitations, and especially how the differentiation of minerals and sediment grain size influences the applications of these proxies needs more clarification. This paper investigates the interactive effects of weathering, hydraulic sorting and sedimentary recycling on river sediment chemistry, and further validates the application of various weathering indices by measuring mineralogical and geochemical compositions of bank sediments and suspended particulate matters (SPMs) from five rivers in East China bearing various sizes, geologic settings and climatic regimes. For a specific river, the silicate weathering intensity registered in the fine SPMs is systematically stronger than that in the coarse-grained bank sediments. Most of the weathering indices not only reflect the integrated weathering history of various catchments but also depend on hydraulic sorting effect during sediment transport and depositional processes. The correlation between CIA (chemical index of alteration) and WIP (weathering index of Parker) offers an approach to predict the weathering trends of the fine SPMs, coarse bank sediments and recycled sediments under the influence of quartz dilution. To minimize the effects of hydrodynamic sorting and sedimentary recycling, we suggest that the fine sediments (e.g. SPMs and <2 μm fraction of bank sediments) in rivers can better reflect the average of present-day weathering crust in catchments and the weathered terrigenous materials into marginal seas and oceans.



Correlations of Al_2O_3/SiO_2 with multiple chemical indices of weathering in the river sediments (a-i). The relationship indicates the mineral sorting control on weathering indices.

(a) Correlations between the CIA and WIP in the river sediments. They distinguish the fine SPMs, coarse bank sediments, and Zhuoshui sediments under the influence of recycling and quartz dilution. The correlation coefficients are based on the data of SPMs of Jiaojiang, Oujiang and Mulanxi. Gray envelopes represent 95% confidence band of the linear regression. (b) The CIA vs. WIP diagram of river sediment samples with different grain sizes. It suggests that only the <2 μm (or >9 Φ) fraction of river sediment can represent the present-day weathering products. Dataset of size-fractional sediments of the Huanghe HH) and Changjiang (CJ) is from Zhou et al. (2015). Data of <63 μm fraction of Changjiang bedload sediments is from He et al. (2015). Data of clay-size fractions of Changjiang, Jiaojiang, Oujiang and Mulanxi sediments is from Bi et al. (2015). (c) The CIA vs. WIP diagram for SPMs and clay fraction (<2 μm or >9 Φ) of the river sediments. The silicate weathering intensity registered in the sediments from rivers entering the East China Sea are evaluated. (d) The CIA vs. WIP diagram for the suspended sediments sampled along river depth profiles and bedload sediments in the Brahmaputra, Ganga and Amazon rivers. The results also suggest that the fine surface suspended sediments can better reflect the present-day weathering products. Data of the suspended and bedload loads in the Brahmaputra are respectively from Garzanti et al., 2011, Garzanti et al., 2010. Data of the Ganga is from Lupker et al. (2012) and the data of Amazon is from Bouchez et al., 2011a, Bouchez et al., 2011b. BL indicates the bedload sediment; SPM denotes suspended particulate matter in a depth profile. Error bars represent two standard deviations (2 δ).

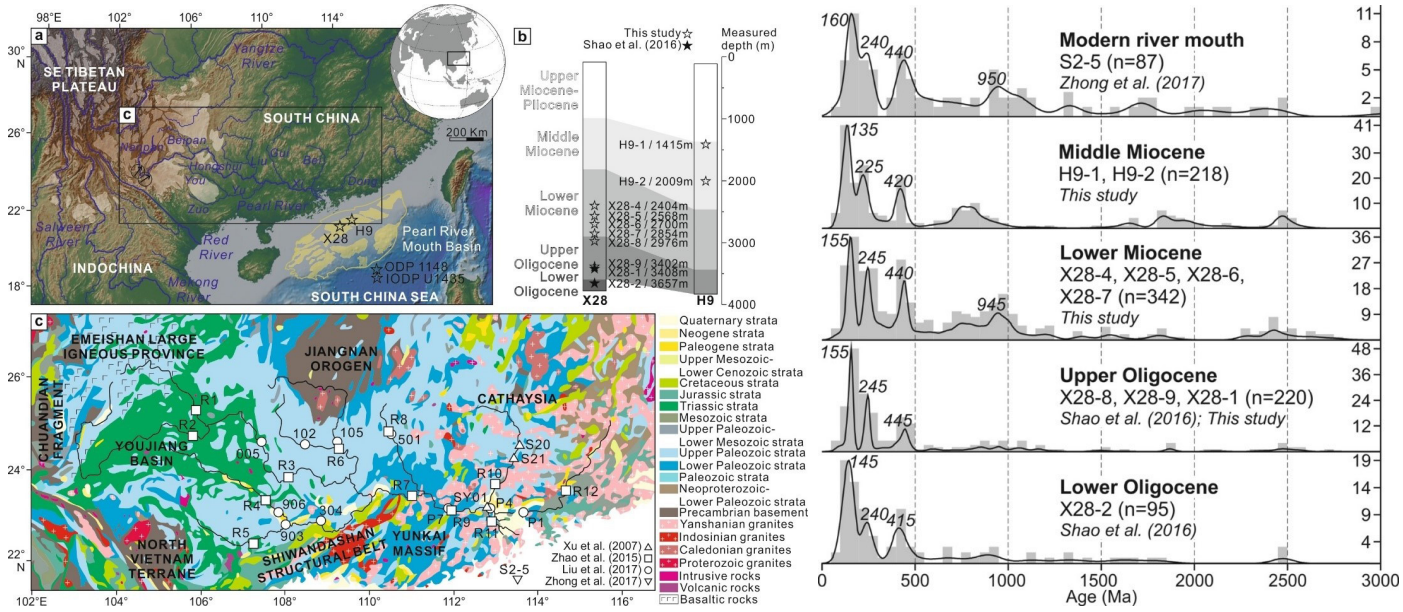
海洋沉积
Marine Sedimentology

Early Miocene birth of modern Pearl River recorded low–relief, high levation surface formation of SE Tibetan Plateau

Cao L, Shao L, Qiao P, et al. Early Miocene birth of modern Pearl River recorded low-relief, high-elevation surface formation of SE Tibetan Plateau. Earth and Planetary Science Letters, 2018, 496:120-131.

Abstract:

Understanding the paradoxical presence of extensive low-relief surfaces perched above deep valleys in SE Tibet is a long-standing challenge. Its origin, based on topographic analysis, has been explained traditionally by incision of a regional relict landscape or, more recently, by in situ formation in response to drainage area loss feedback. Here we apply a qualitative and quantitative source-to-sink approach to test whether either of the two mechanisms may apply by establishing potential links among detrital zircon provenance of the Oligocene – Miocene Pearl River Mouth Basin, drainage evolution of the Pearl River, and low-relief, high-elevation surface formation in the SE Tibetan Plateau margin. Our zircon record, combined with previous geochemical records from the northern South China Sea, confirms a significant Late Oligocene provenance shift, represented by an intensive addition of Proterozoic zircons and a gradual negative excursion in Nd isotopes. We interpret this provenance shift as a response to a progressive drainage expansion of the Pearl River, evolving from relatively small rivers confined to coastal South China in the Early Oligocene to a near-modern continental-scale drainage configuration in the Early Miocene, which may be correlated with an earlier surface uplift of SE Tibet than previously thought. This westward expansion process of the Pearl River favors the envisaged drainage evolution of the relict landscape model over that of the drainage area loss feedback model, suggesting that the Middle – Late Cenozoic low-relief, high-elevation surface formation in SE Tibet may be readily interpreted as preserving past tectonic and environmental conditions.



(a) Topographic map of the study area showing large rivers flowing from the SE Tibetan Plateau to the South China – Indochina margin and the localities of studied commercial boreholes (X28 and H9) drilled in the Pearl River Mouth Basin. The previous ODP Site 1148 and IODP Site U1435 drilled close to the continental-oceanic boundary are also shown. White and yellow shaded areas represent low-relief, high-elevation surfaces in the SE Tibetan Plateau (Clark et al., 2006) and main depressions in the Pearl River Mouth Basin, respectively. Two black arrows between the Nanpan River and Red River trunk mark the northeastward paleocurrent directions of the Eocene fluvial deposits(Wissink et al., 2016). (b) Simplified stratigraphic columns of boreholes X28 and H9 showing the positions of Oligocene to Middle Miocene samples analyzed in this study and by Shao et al. (2016). (c) Geological map of the Pearl River drainage basin displaying the locations of previous modern samples collected from river courses and near estuary (see Table S1 for compiled data and references). (For interpretation of the colors in this figure, the reader is referred to the web version of this article.)

Comparison of zircon U – Pb ages from Oligocene – Middle Miocene strata of boreholes X28 and H9 in the northern Pearl River Mouth Basin as well as modern coastal sediments near the river mouth. n—number of concordant analyses.

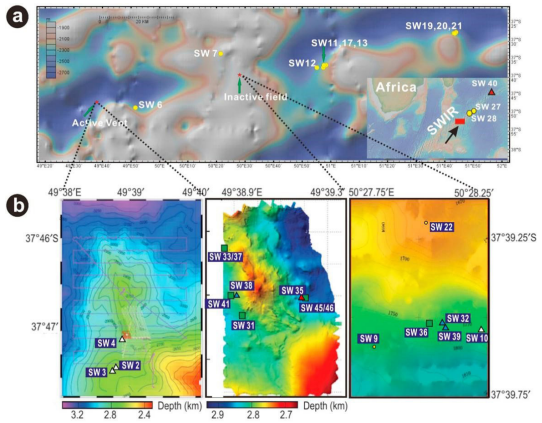
大洋岩石圈演化
Ocean Lithospheric Evolution

Geochemical impacts of hydrothermal activity on surface deposits at the Southwest Indian Ridge

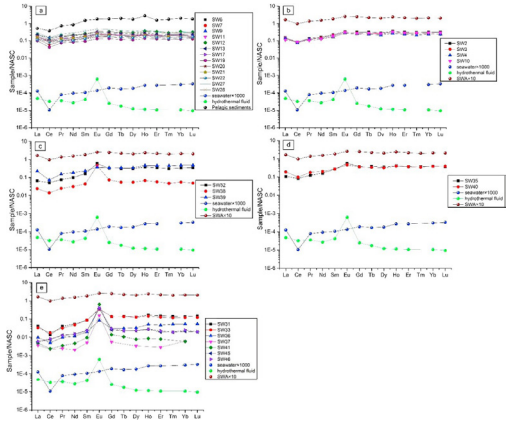
Anyang Pan, Qunhui Yang, Huaiyang Zhou, et al. Geochemical impacts of hydrothermal activity on surface deposits at the Southwest Indian Ridge. Deep-Sea Research Part I, 2018, 139:1-13.

Abstract:

Submarine hydrothermal circulation has attracted much scientific interest since seafloor hydrothermal activity was first observed in the 1970s; an area of particular interest is the impact of exported inorganic and organic materials from hydrothermal vent systems into the open ocean. In 2007, the first active hydrothermal vent field, with vent fluid temperatures up to 379 ° C, was discovered at the ultraslow spreading Southwest Indian Ridge (SWIR), where active vents are much less abundant than fast spreading ridges, and the effect of hydrothermal extrusion on surface sediments is not fully understood. To explore how geochemical proxy signatures respond to hydrothermal activity, we investigated the distributions of elements, minerals and lipids in surficial normal marine sediments, metalliferous sediments and low-temperature hydrothermal deposits collected from the SWIR. The results showed different effects of hydrothermal activity on the surface deposits. The normal marine sediments were predominantly calcium carbonate characterized by > 42% CaO and > 90% calcite, with a significant autochthonous marine contribution to organic matter (OM) and a predominance of lower molecular weight alkanols and fatty acids; they were uninfluenced by hydrothermal activity but received some terrigenous input represented by abundant high molecular weight n-alkanes with an odd-over-even predominance. The near-field metalliferous sediments and hydrothermal deposits were very different. Some near-field metalliferous sediments were influenced by low-temperature hydrothermal activity, and their distributions of elements and minerals were similar to those of hydrothermal deposits, which were characterized by abundant Fe/Si and opal/nontronite. Other near-field metalliferous sediments were evidently influenced by mixing of high-temperature hydrothermal sulfides typically containing abundant Cu/Zn. With respect to the organic matter assemblages, near-field deposits contained little evidence for thermal maturation of organic matter and all were characterized by a strong microbial signature, including hopanoids, isoprenoidal and non-isoprenoidal dialkyl glycerol ether lipids, and low molecular weight n-alkanes with an even carbon number predominance. The far-field metalliferous sediments, despite the influence of non-buoyant plumes and slightly higher concentrations of hydrothermal-derived metals (e.g., Fe, Cu and Zn), had the same distribution of organic lipids and major mineral composition (> 90% calcite) as did normal marine sediments. Thus, the influence of non-buoyant plume inputs appears to have been minimal possibly due to the dilution of in situ microorganisms by normal marine organisms in sediment and seawater. Furthermore, these characteristics indicate inorganic indices based on abundant metal elements derived from the hydrothermal systems (such as Fe/Cu/Zn content, ∑ REE/Fe, the ternary diagram of Fe, Cu×100 and Ca) are more sensitive, serving as better proxies than organic matter assemblages to differentiate the effects of diverse hydrothermal activity on surface deposits.



Station location map at the Southwest Indian Ridge (after Pan et al., 2016). Locations are shown for (a) most background sediments (yellow circles) and (b) the far-field metalliferous sediments (M-T1, white triangles), near-field metalliferous sediments (M-T2 and M-T3, blue and red triangles, respectively), and low-temperature hydrothermal deposits (green squares). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.).



North American shale composite-normalized rare earth element (REE) distribution patterns of background sediments (Panel a), M-T1 (Panel b), M-T2 (Panel c), M-T3 (Panel d) and hydrothermal deposits (Panel e) from the SWIR. Data for seawater, hydrothermal fluid and pelagic sediment are from Douville et al. (1999), Schmidt et al. (2007) and Wang et al. (1982), respectively.

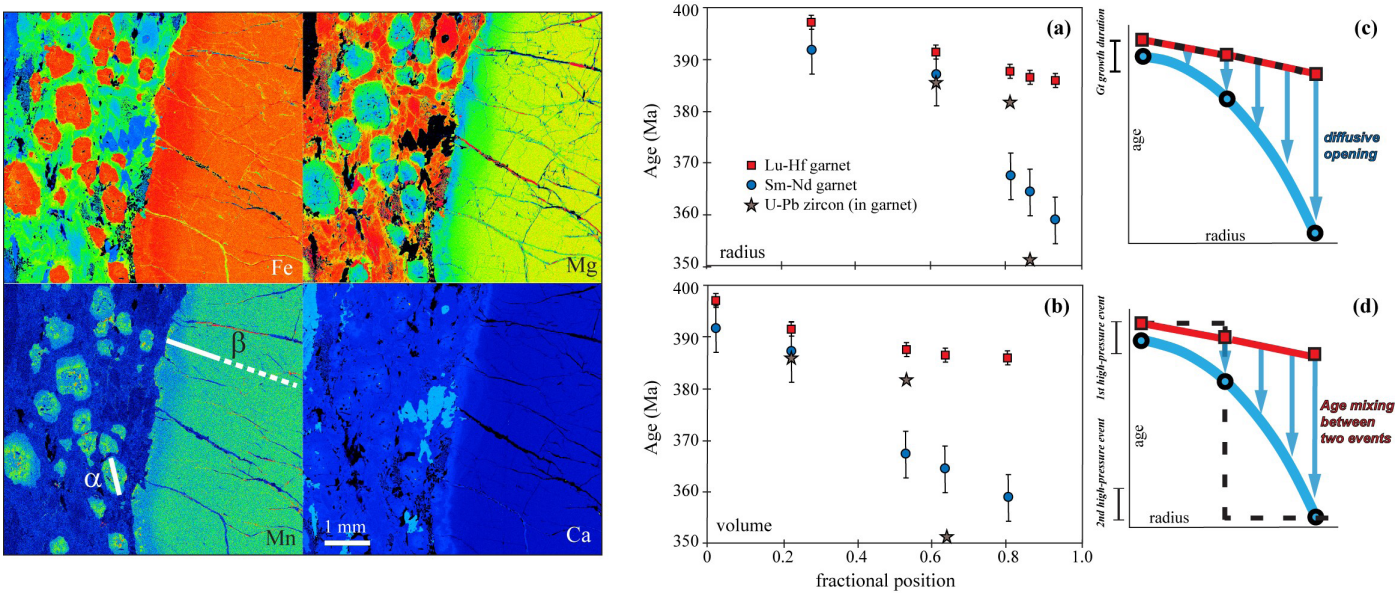
大洋岩石圈演化
Ocean Lithospheric Evolution

Coupled Lu–Hf and Sm–Nd geochronology on a single eclogitic garnet from the Huwan shear zone, China

Cheng H, Vervoort J D, Dragovic B, et al. Coupled Lu-Hf and Sm-Nd geochronology on a single eclogitic garnet from the Huwan shear zone, China. Chemical Geology, 2018, 476:208-222.

Abstract:

We present coupled Lu − Hf and Sm − Nd dates from multiple growth zones within a single large garnet porphyroblast in an eclogite from the Huwan shear zone in the Hong'an orogen, central China. The eclogite sample contains large garnet porphyroblasts up to several centimetres in diameter and a second major population of smaller, millimetre-sized garnet grains. Elemental compositions and mineral inclusions in garnet suggest that the large garnet crystal formed during an early episode of metamorphism, with the abundant small-sized garnets in the matrix growing during a late metamorphic period contemporaneous with the overgrowth of the rim of the large garnet crystal. Ten coupled Lu − Hf and Sm − Nd dates determined from five micro-sawed garnet sections of a ~ 2 cm garnet coherently decrease from core to rim. Lu − Hf dates from each section are consistently older than the corresponding Sm − Nd dates. Petrographic and chemical observations of the eclogite show that three generations of garnet growth occurred, with the latter two generations coincident with growth of the rim of the large garnet, and that of the smaller matrix garnets. Five micro-sawed growth zones were analysed for Lu − Hf and Sm − Nd isotopes. The calculated Lu − Hf dates from the mega garnet record garnet growth initiation at about 397 Ma, during prograde to peak metamorphic conditions of the first orogenic episode, lasting about 11 Ma. Sm − Nd garnet dates are systematically younger than corresponding Lu − Hf dates, with the Sm − Nd garnet rim date > 25 Ma younger than the Lu − Hf date. We suggest that the Sm − Nd dates represent a combination of 1) growth and simultaneous diffusion at elevated temperatures during the first metamorphic episode, 2) diffusive age resetting as a result of continued elevated temperatures during residence at mid-crustal depths and/or slow cooling between the two orogenic episodes, and 3) mixing of growth generations. U − Pb dates on three zircon inclusions from the garnet separates range from 386 to 351 Ma, possibly suggesting zircon crystallization during exhumation and cooling. This study highlights that coupled microsampling Lu − Hf and Sm − Nd chronology on a single garnet (down to ~ cm in diameter) can help decipher the timescales of burial and heating (for Lu − Hf) and cooling from elevated temperatures (for Sm − Nd) from a single orogenic cycle, and that zoned Lu − Hf and Sm − Nd garnet can be utilized as a geo (thermo) -chronometer. Lastly, these Lu − Hf garnet, Sm − Nd garnet and U − Pb zircon dates confirm an early high-pressure metamorphic episode during the Devonian before the final convergence of the South China and North China Blocks in the Triassic.



Electron microprobe X-ray element intensity maps for dated samples. Color corresponds to elemental concentrations, with warm colors representing higher concentrations. Lu − Hf garnet, Sm − Nd garnet, and U − Pb zircon dates. Dates for Lu − Hf garnet (squares), Sm − Nd garnet (circles) and U − Pb zircon inclusions in corresponding garnet separates (stars) as a function of (a) fractional radial position and (b) fractional volumetric position. The uncertainty of the estimate of the relative radius and volume of the measured sections is not considered. Conceptual diagrams showing the effect of diffusive opening of (c) Sm − Nd systematics and (d) polymetamorphism and age mixing on the resultant calculated garnet dates.

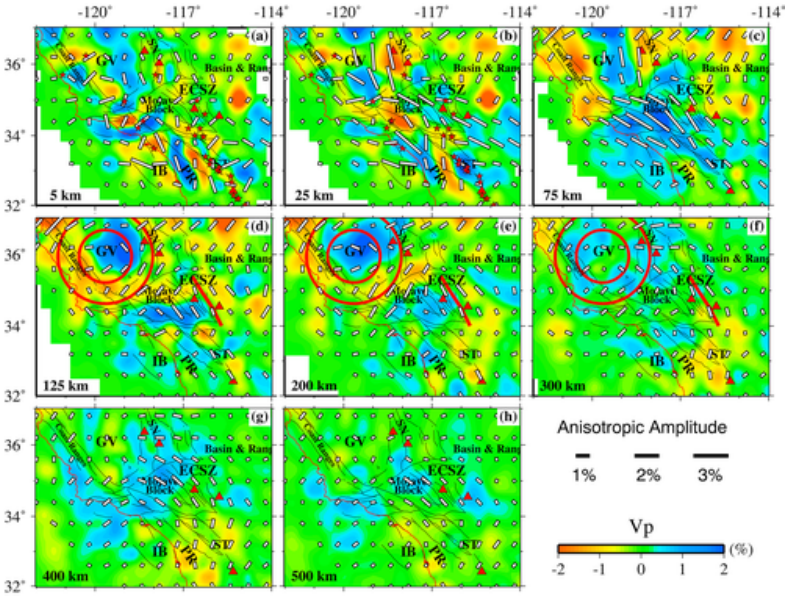
油气地质与地球物理
Petroleum Geology and Geophysics

Lithospheric Deformation and Asthenospheric Flow Associated With the Isabella Anomaly in Southern California

Yu YQ, Zhao DP. Lithospheric Deformation and Asthenospheric Flow Associated With the Isabella Anomaly in Southern California . Journal of Geophysical Research Solid Earth, 2018, 123: 8842-8857.

Abstract:

Both laboratory experiments and seismic observations indicate that the solid Earth is composed of strongly anisotropic materials and its dynamics can be better constrained by exploring seismic anisotropy. Due to the limited number and poor depth resolution of currently available seismic anisotropy measurements, tectonic regimes of upper mantle deformations beneath Southern California still remain enigmatic and controversial. Here we present high-resolution three-dimensional models of P wave azimuthal and radial anisotropy in the crust and upper mantle beneath Southern California obtained by a joint inversion of local-seismic and teleseismic P wave data. Our results reveal significant depth-dependent anisotropy in which fast orientations in the lithospheric mantle closely follow the strike of the San Andreas fault and those in the asthenosphere are characterized as a predominantly circular pattern centered in the robust high-velocity Isabella anomaly beneath the Great Valley. The Isabella anomaly is possibly a remnant of the fossil Farallon slab and is currently experiencing a tectonic regime of lithospheric downwelling, contributing to the development of a circular asthenospheric flow. High-velocity anomalies are revealed below 300-km depth beneath areas surrounding the Great Valley, which may reflect the delaminated lithospheric segments. Different rifting processes may take place beneath the Inner Borderland and the Salton Trough whose developments are possibly related to regional mantle upwelling and lithospheric stretching, respectively.



Map views of P wave isotropic tomography and azimuthal anisotropy. The orientation and length of the white bars denote the fast-velocity direction and the amplitude of azimuthal anisotropy, respectively. The background colors show P wave velocity variations from isotropic tomography. The red circles and the red thick line in (d)-(f) typically depict the circular pattern of azimuthal anisotropy and deflected mantle flow, respectively. GV = Great Valley; PR = Peninsular Ranges; SN = Sierra Nevada; ST = Salton Trough; ECSZ = Eastern California Shear Zone; IB = Inner Borderland. The other symbols are the same as those in Figure 1.

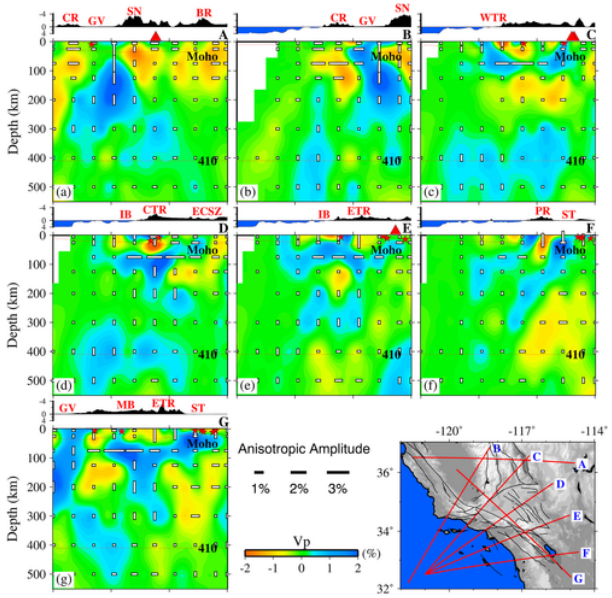


Fig. 8.Vertical cross sections of P wave isotropic tomography and radial anisotropy. The horizontal white bars indicate that the horizontal velocity is faster than the vertical velocity and vice versa. The length of the bars denotes the amplitude of radial anisotropy. Red stars and triangles denote large earthquakes (M > 6.0) and Cenozoic volcanoes shown in Figure 1, respectively, within a 50-km width of each profile. BR: Basin and Range; CR: Coast Ranges; MB: Mojave Block.

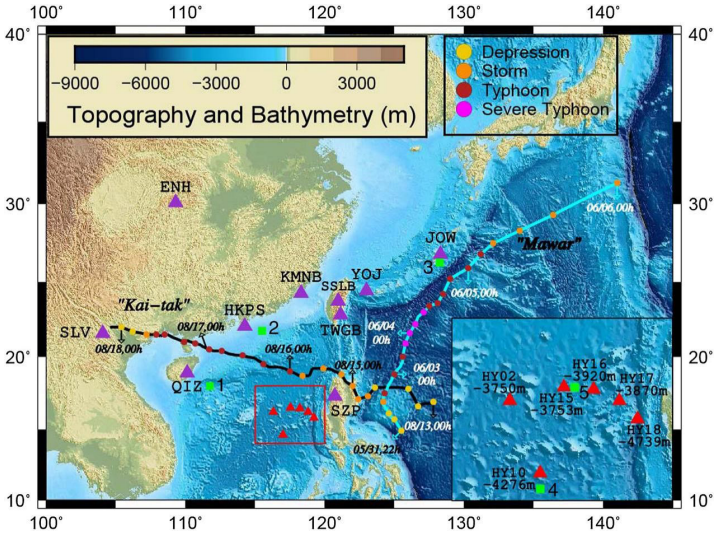
油气地质与地球物理
Petroleum Geology and Geophysics

The Characteristics of Microseisms in South China Sea: Results From a Combined Data Set of OBSs, Broadband Land Seismic Stations, and a Global Wave Height Model

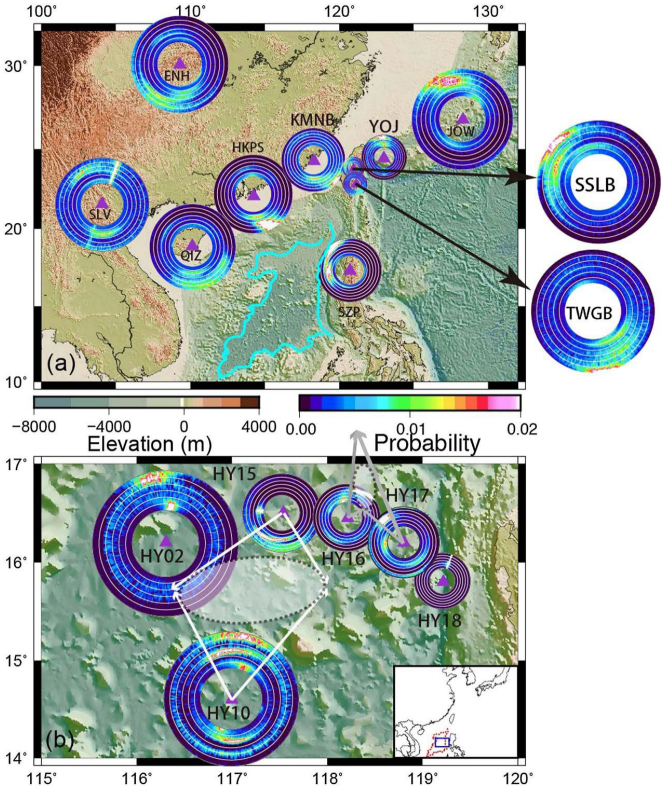
Han Xiao, Mei Xue, Ting Yang, et al. The Characteristics of Microseisms in South China Sea: Results From a Combined Data Set of OBSs, Broadband Land Seismic Stations, and a Global Wave Height Model. Journal of Geophysical Research-Solid Earth, 2018, 123: 3923-3942.

Abstract:

It has long been recognized that ocean gravity waves can generate microseisms through their interactions and coupling with the solid earth. Their generation mechanisms, wave types, and propagation have been studied and debated intensively. In this study, we focus on the characteristics of microseisms in South China Sea (SCS) and compare them with globally observed microseisms. We use data from six ocean bottom seismometers, 10 publicly available broadband land seismometers near SCS, and a reanalyzed global wave height model from 1 May 2012 to 20 August 2012 (UTC), the time span of ocean bottom seismometers' data. We apply three techniques including power spectral density, correlation, and frequency dependent polarization analysis. Our results show that (1) microseisms observed in SCS are dominated by sources from adjacent oceans, instead of the common global sources from the Pacific, Atlantic, or Indian Ocean; (2) the split of double - frequency microseisms (DFMs) is observed in SCS, especially on land stations: the sources are located near the central sea basin for long - period DFMs (0.1 – 0.25 Hz) and are local near stations for short - period DFMs (0.25 – 0.5 Hz); (3) typhoons both strengthen microseisms and affect the source locations of microseisms with the biggest influence on the short - period DFMs; and (4) microseisms in or near SCS are a mixture of Love and Rayleigh waves and the relative dominance of Love and Rayleigh waves changes with locations.



Map of the seismic stations and the center track of the typhoons Mawar and Kai-tak. The red triangles indicate the positions of the ocean bottom stations; the purple triangles are land stations used; the locations of reanalyzed significant ocean wave height data are represented as green squares. The inset is a blowup of the region in the red square showing the station name and depth of OBSs. The cyan line and black line represent the track of typhoon Mawar and Kai-tak, respectively. The color circles indicate typhoons category.



The probability distribution of the predominant polarization directions for microseisms is at (a) land stations and (b) OBSs, respectively. Each polarization diagram includes 112 days' results from 1 May 2012 to 20 August 2012 and is characterized by the coming azimuths of microseisms and their frequencies (indicated by the radius). The inner to the outer circles correspond to 0.01, 0.1, 0.2, 0.3, 0.4, 0.5 and 0.6 Hz, respectively, covering the whole microseisms' band. The color indicates the probability of microseisms coming from a direction. The step is 1° for the azimuths. The thick light blue line in SCS indicates the continent and ocean boundary (COB). The white translucent ellipses outlined by gray dashed lines indicate possible common source regions for HY15 and HY10 as well as HY16 and HY17 respectively.

油气地质与地球物理
Petroleum Geology and Geophysics

Stress shadow on the southwest portion of the Longmen Shan fault impacted the 2008 Wenchuan earthquake rupture

Chang Liu, Peiyu Dong, Bojing Zhu, et al. Stress shadow on the southwest portion of the Longmen Shan fault impacted the 2008 Wenchuan earthquake rupture. Journal of Geophysical Research-Solid Earth, 2018, 215: 450-470.

Abstract:

The 2008 Wenchuan earthquake (Mw 7.9) unilaterally ruptured the Longmen Shan fault (LMSF) along eastern Tibet. The earthquake rupture propagated about 270 km northeastward, whereas it propagated only about 20 km southwestward along the strike of the fault. Although a significant attention has been paid to the question of predominantly unilateral propagation, the primary reasons for this type of propagation remain unclear. In this research, we examined the change of Coulomb stress along the LMSF caused by the historical earthquakes near and on the LMSF from 1725 to 2008. We found that the 14 preceding large earthquakes (M ⩾ 6.5) on the Xianshui He fault cast a stress shadow on the SW segment of the LMSF, which was not activated by the 2008 Wenchuan earthquake rupture. The 1970 Dayi earthquake on the SW segment of the LMSF contributed significantly to this stress shadow. Compared with the segment of the 2008 Wenchuan earthquake rupture, this stress shadow caused strong stress contrasts of -214,-22, and -80 kPa in the seismic gap of the very SW segment of the LMSF, the rupture zone of the 2013 Lushan earthquake, and the seismic gap between the 2008 Wenchuan and 2013 Lushan earthquake ruptures, respectively. Stress contrasts in these values were consistent with tectonic loading over 165, 17, and 62 years, respectively, by integrating an interseismic stress-loading rate of 1.3 kPa/a. We proposed that this stress shadow might have created a barrier at the SW segment, preventing the earthquake rupture propagating southwestward.

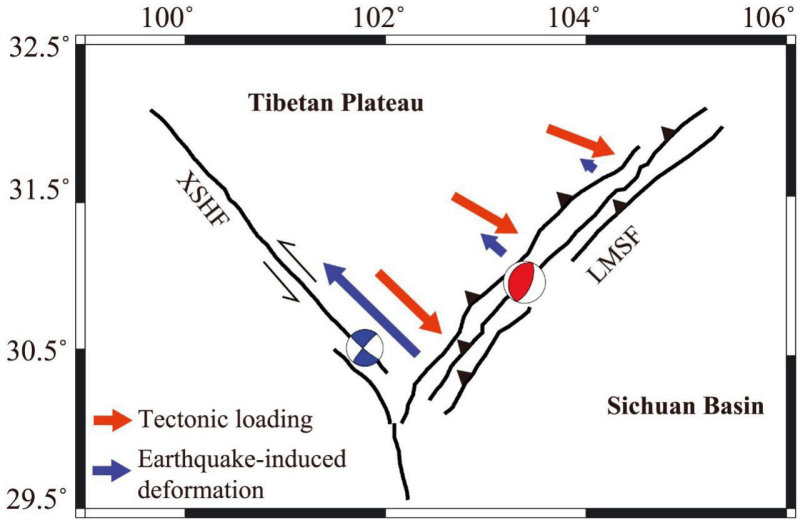


Illustration of the interaction process between the Xianshui He fault (XSHF) and the Longmen Shan fault (LMSF). Arrows indicate the compensation effect on the tectonic loading by the earthquake triggering process on the XSHF from the point view of crustal deformation.

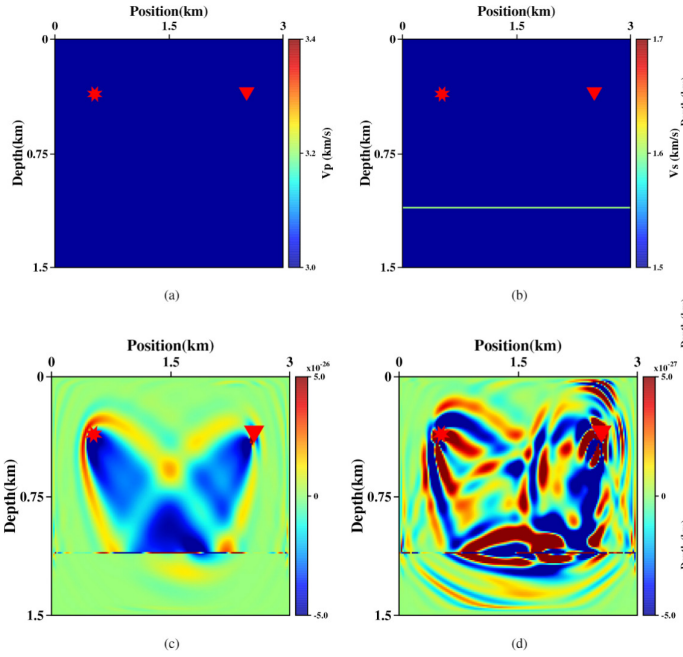
油气地质与地球物理
Petroleum Geology and Geophysics

Elastic wave–equation–based reflection kernel analysis and traveltime inversion using wave mode decomposition

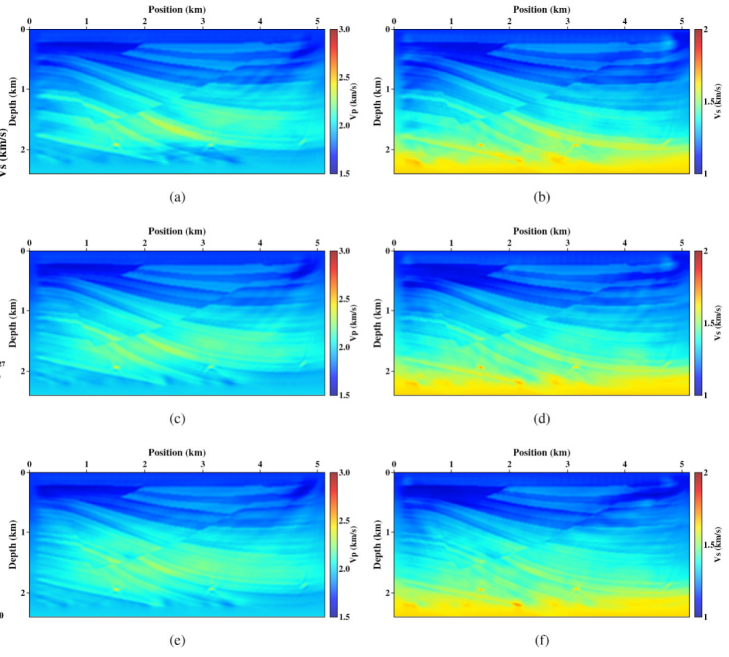
Tengfei Wang, Jiubing Cheng, Qiang Guo, et al. Elastic wave-equation-based reflection kernel analysis and traveltime inversion using wave mode decomposition. Geophysical Journal International, 2018, 215:450-470.

Abstract:

Elastic reflection waveform inversion (ERWI) utilizes reflections to update the low and intermediate wavenumbers in the deeper part of elastic models and can provide good initial models for elastic full waveform inversion (EFWI). Although ERWI aims to mitigate the nonlinearity of inversion when starting from a poor initial model, it suffers from the cycle-skipping problem due to the objective function of waveform fitting. Building initial P-and S-wave velocity models for EFWI through elastic wave-equation reflection traveltime inversion (ERTI) would be effective and robust since traveltime information relates to the background model more linearly. However, the current implementations of acoustic traveltime inversion is not straightforward in elastic media due to the existence of S-wavefields. Wave mode decomposition, both on the recording surface and in the extrapolated wavefields, is important for ERTI. First, for seismic data with P-wave sources, the P/S separation of multicomponent seismograms isolates the PP and PS reflection events and thus make it possible to extract the event-to-event time-shifts of these isolated reflections through dynamic image warping (DIW). Then, we can use the traveltime residuals of PP and PS reflections to build the objective function for ERTI. Second, based on the investigation of the complicated reflection kernels in an elastic medium, we demonstrate the necessity of wave mode decomposition applied on the extrapolated elastic wavefields, to suppress the artefacts induced by the undesirable cross-correlations of the components in forward and back-propagated wavefields. Therefore, the decomposition of surface recording data and extrapolated wavefields guarantees the dominate contribution of the traveltime is included during the ERTI. Accordingly, we propose a two-stage method to first build the P-wave background velocity using the separated PP reflections and then build the S-wave background velocity using the separated PS reflections based on the well-recovered P-wave velocity model. A numerical example of the Sigsbee2A model shows the effectiveness of the proposed ERTI approach.



Reflection kernels for a horizontal interface due to the perturbation of P-wave velocity at the depth of 1.1 km: (a) Vp, (b) Vs, (c) KVp and (d) KVs.



Recovered Vp (left) and Vs (right) by ERTI + EFWI with different high-pass filtering of the seismograms. The low-cut frequencies are 3.0, 5.0 and 7.0 Hz from top to bottom, respectively.

油气地质与地球物理
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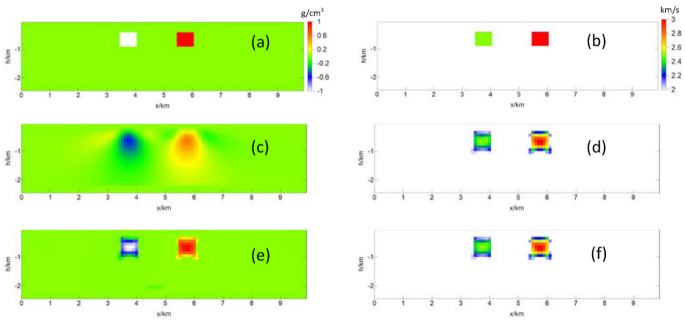
Linear correlation constrained joint inversion using squared cosine similarity of regional residual model vectors

Bo Shi, Peng Yu, Chongjin Zhao, et al. Linear correlation constrained joint inversion using squared cosine similarity of regional residual model vectors . Geophysical Journal International, 2018, 215: 1291-1307.

Abstract:

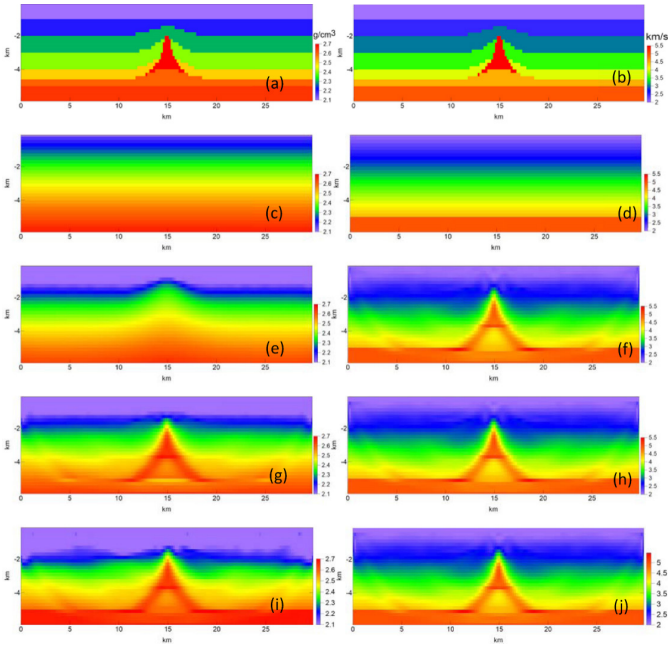
Inversion of geophysical data is inherently non-unique, so joint inversion has been used to reduce the ambiguity of inversion. Among other things, the coupling between different physical parameters is crucial in geophysical joint inversion. In this paper, we improve the coupling constraint based on 'Squared Cosine Similarity' of regional residual model vectors for joint inversion. Compared with the widely used coupling constraints in joint inversion, such as the cross-gradients constraint and the gradients dot product constraint, whose coupling are constructed by the computing of model parameter's gradient using 'local' adjacent grids to calculate the derivatives in specified directions, the 'region' of the new proposed constraint is defined as a specified model space in which two vectors to compute the dot product of cosine similarity should satisfied the condition they are linear correlated, because the constraint we designed is to force the value of squared cosine similarity in this 'region' tends to 1. If the condition is satisfied, the 'region' may be any size in the model space, i.e. the whole model space or small as the 'local' grids. As for the 'residual model vector', it means the difference between the inversed model parameter with the reference background models, and usually the background is taken as the initial model of inversion in the defined region, that is the uniform half space. As for the 'squared', it means no matter the regional residual vector's varying direction is same or opposite, the value of squared cosine similarity always tends to 1. Then we compute the squared cosine similarity from regional residual model vectors and constrain all the region's summed value to be 1 to enforce the linear correlation of regional model variations during joint optimization. So the proposed constraint will result in enforcing the correlation between regional model parameters' variations.

We conduct model tests with an application of seismic traveltimes and gravity anomaly to verify the proposed constraint in joint inversions, and we can see the improvement of the joint inversion over the results of separated inversions and cross-gradients or gradient dot product constrained joint inversion. We calculate the values of cross-gradients, dot product and the rock's physical relationship to prove that joint inversion with this new constraint can improve the linear correlation between velocity and density variations, avoid computing the model gradients of the adjacent 'local' grids and reduce the local discontinuities. We also test the proposed constraint on field data with gravity and magnetic anomaly in Lower Yangtze region, China, and the result reveals the consistency of high density and high magnetic basement.



Synthetic models and inversion results of complex models. (a) True density model, (b) true velocity model, (c) density initial model, (d) velocity initial model, (e) single inversion result of gravity, (f) single inversion result of seismic, (g) joint inversed density result with new cosine similarity constraint (150*30 whole model space grid), (h) joint inversed velocity result with new cosine similarity constraint (150*30 whole model space grid), (i) joint inversed density result with new cosine similarity constraint (10*10 model grids), (j) joint inversed velocity result with new cosine similarity constraint (10*10 model grids), (k) joint inversed density result with new cosine similarity constraint (15*15 model grids), (l) joint inversed velocity result with new cosine similarity constraint (15*15 model grids), (m) joint inversed density result with new cosine similarity constraint (20*20 model grids) and (n) joint inversed velocity result with new cosine similarity constraint (20*20 model grids).

Synthetic model 2 and recovered models. (a) true density model, (b) true velocity model, (c) separated density inversion, (d) separated velocity inversion, (e) joint inversed density model with new constraint and (f) and joint inversed velocity model with new constraint.



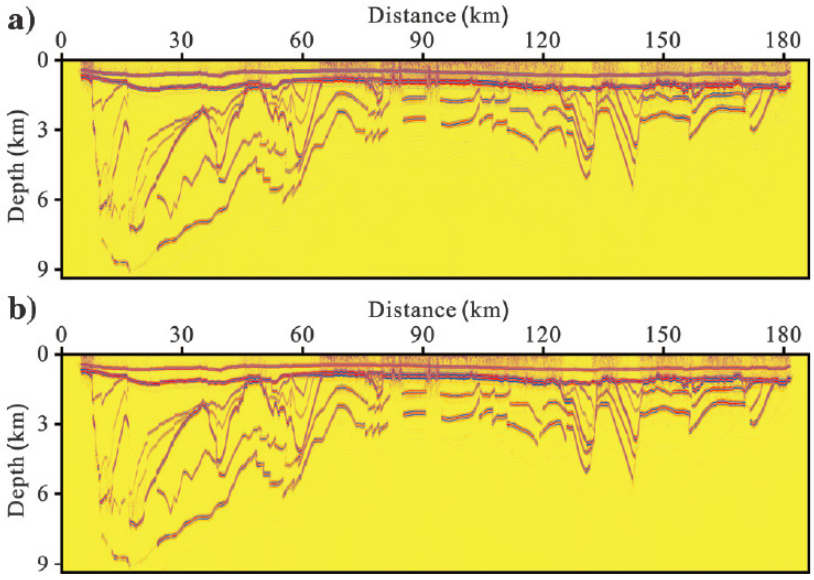
油气地质与地球物理
Petroleum Geology and Geophysics

Vector–wave–based elastic reverse time migration of ocean–bottom 4C seismic data

Yu PF, Geng JH, Ma JQ. Vector-wave-based elastic reverse time migration of ocean-bottom 4C seismic data. Geophysics, 2018, 83: S333-S343.

Abstract:

The acoustic-elastic coupled equation (AECE) has several advantages when compared with conventional scalar-wave-based elastic reverse time migration (ERTM) methods used to image ocean-bottom multicomponent seismic data. In particular, vector-wave-based ERTM requires vectorial P- and S-waves on the source and receiver sides, but these cannot be directly obtained from wavefield extrapolation using AECE. Therefore, we have developed a P- and S-wave vector decomposition (VD) approach within AECE; this approach enables the deduction of a novel VD-based AECE, from which vectorial P-and S-waves can be obtained directly via wavefield extrapolation. We are also able to derive a new formulation suitable for vector-wave-based ERTM of ocean-bottom multicomponent seismic data that can generate a phase-preserved PS-image. Three synthetic examples illustrate the validity and effectiveness of our new method.



Multishot stacked results of PP-images with receiver-side tensorial extrapolation using (a) a scalar-wave-based imaging condition, and (b) a vector-wave-based imaging condition..

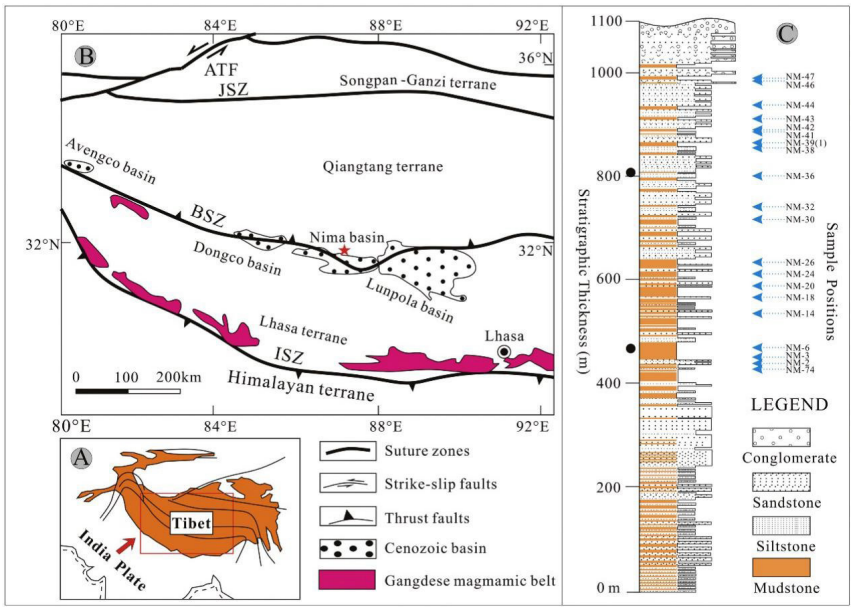
海洋有机生物地球化学
Marine Organic Biogeochemistry

High–relief topography of the Nima basin in central Tibetan Plateau during the mid–Cenozoic time

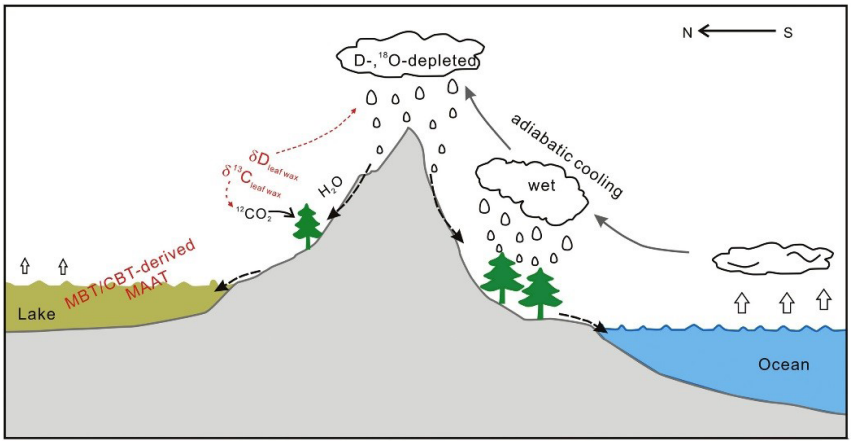
Deng LH, Jia GD. High-relief topography of the Nima basin in central Tibetan Plateau during the mid-Cenozoic time. Chemical Geology, 2018, 493: 199-209.

Abstract:

There remains inconsistence of uplift history of the Tibetan Plateau. Here, we estimated paleoelevation of mid-Cenozoic Nima basin located in central Tibet using multi proxies. They included meteoric water and vegetation isotope proxies based on hydrogen and carbon isotopic compositions (δ D and $\delta^{13}C$), respectively, of terrestrial plant wax lipid of n-alkanes and temperature proxy derived from microbial membrane lipid of branched glycerol dialkyl glycerol tetraethers (brGDGTs). Lipid analysis on sedimentary rocks in the Nima basin yielded -222 ± 12‰ and -30.0 ± 0.7‰ for δ D and $\delta^{13}C$ of n-C_{29} alkane, respectively, and brGDGT-derived mean annual air temperature (MAAT) of 21.5 ± 3.1 degrees C for the paleo basin. Using the sea-level meteoric water $\delta^{18}O$ and Miocene Siwalik paleovegetation $\delta^{13}C$ as low elevation references, values of δ D and $\delta^{13}C$ of n-C_{29} alkane in this study suggested paleoelevations of 4546 m and 2800 m, respectively. Whereas by using a subtropical sea surface temperature as a reference, brGDGT-derived MAATs suggested a paleoelevation of 893 m. We believed that the three estimates reflect a high-relief topography in the study basin during the mid-Cenozoic, representing elevations of orographic barrier of southerly oceanic moisture, basin catchment and basin lake level, respectively. This scenario implies a low elevation of the basin relative to the Lhasa Terrane located to the south during the mid-Cenozoic, hence challenging the classical crustal thickening models assuming a simple crustal thickening-uplift relationship.



The Tibetan Plateau. B) The geological background of the Nima basin on the Tibetan Plateau (after DeCelles et al., 2007a). ATF: Altyn Tagh fault; BSZ: Banggong suture zone; JSZ: Jingsha Suture zone; ISZ: Indus-Yarlung suture zone. C) Stratigraphic section Dagze Co from which the samples reported here were collected. Two black dots indicate the position of ages of 24.9 ± 0.1 Ma and 25.8 ± 0.2 Ma determined in the nearby section 1DC (DeCelles et al., 2007b) based on magnetostratigraphic correlation



A sketch showing different implications of elevation proxies in this study. Different from on the windward side, δ D of leaf wax lipids on the leeward side reflects D-depleted moisture climbing over the mountain barrier that is higher than where terrestrial plants grow. Whereas δ 13C of leaf wax lipids reflect growth conditions determined by local elevation. BrGDGTs are mainly produced in the lake, thus reflecting near lake surface temperature. Note that this sketch is only appropriate to sites receiving moisture from a single source of the tropical Ocean as assumed in the text, and latitudinal and continental effects are neglected.

专著
Books

汪品先院士近期《地球系统与演变》和《瀛海探径》两部著作出版

Academician Wang Pin-xian recently published two books, 《Earth System and Evolution》 and 《YingHai Exploration》

《地球系统与演变》全书彩页，图文并茂，是汪先生 20 年课堂实践和 3 年编写工作的产物。20 世纪末期为了追踪人类排放碳的去向，科学界从大气、海洋到植被、土壤，来了次空前的大清查，学术界开始了“全球变化”的研究方向。“全球变化”提出的科学问题要求向时空伸展，驱使学术界将地球表层看作整体，从宇宙大爆发追踪到人类智能的产生，诞生了研究“地球系统科学”的新领域。汪先生从 1990 年代晚期起，先后开设了“全球变化”和“地球系统”研究生课程，这本书就是 20 年课程的结晶。

地球科学产生以来的两百年里，科目越分越多、越分越细。而发展到一定程度又回过头来相互结合，集成为系统科学，这就是地球系统科学。本书的目的是“正本清源，展示出这是探索地球圈层相互作用，整合各种学科，将地球作为一个完整系统来研究的学问。”该书的发行在国内产生重大反响。

《瀛海探径》则是汪先生的科学人文随笔，是他作为一名科学工作者 20 来年发表在报刊上的随笔，分为“走向深海”（10 篇）、“创新思维”（15 篇）及“科海觅趣”（7 篇）三部分。《瀛海探径》中反映了汪先生思想与谋略的引领力与影响力；点点滴滴无不流露着几十年如一日坐着冷板凳的汪先生为国为民的情谊，他的一颗拳拳报国心。正如引言中所说“我衷心希望《瀛海探径》的读者能够‘开卷有益’，希望从中能获取海洋、尤其是关于深海的知识，能听到如何在文化的深层次里排除创新思维的障碍，真的向创新型社会前进的呼声。”

The colored pages of the book 《Earth System and Evolution》 are full of pictures and insightful texts. It is the product of Prof. Wang's 20 years of classroom practice and three years of writing work. In the late 20th century, in order to track the fate of human carbon emissions, the scientific community has come to an unprecedented large-scale investigation from the atmosphere, the ocean to the vegetation and the soil. The academic community has begun the research direction of “global change”. The scientific problems raised by "global change" require stretching into time and space, driving the academic community to consider the earth's surface as a whole, from the outbreak of the universe to the generation of human intelligence, leading to the birth of a new field of research on "earth system science." Since the late 1990s, Prof. Wang has successively run the “Global Change” and “Earth System” courses for graduates, and the book is the crystallization of the 20-years of course lecture.

In the two hundred years since the birth of earth science, the subjects have become more and more divided and minimized. Now they have come back to each other and integrated into system science. This is the Earth System Science. The purpose of this book is to use "the original clear source to show a study that explores the interaction of the Earth's spheres, integrates various disciplines, and studies the Earth as a complete system." The publication of the book has produced major repercussions in the country.

《YingHai Exploration》 is a collection of Prof. Wang's scientific essays and comments on the contemporary culture published in newspapers over the past 20 years. It is divided into three parts: "going to the deep sea" with 10 articles, "innovative thinking" with 15 articles, andnd "Kehai Fun" with 7 articles. The 《YingHai Exploration》 reflects the leading power and influence of Prof. Wang's thoughts and strategies; every bit of it reveals his patriotic sentiment as a scholar sitting on the bench for decades to search for answers to scientific and cultural questions. As mentioned in the introduction, he said, “I sincerely hope that the readers of 《YingHai Exploration》 will benefite from opening the book to gain knowledge of the ocean, especially about the deep sea, and hear how to exclude obstacles of innovative thinking in the deeper level of culture, and hear a genuine voice of moving forward to an innovative society."

论文与专利
PUBLICATIONS AND PATENTS

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发明专利
Invention Patents

2018 年度共授权 13 项发明专利，其中 6 项发明专利，6 项实用新型专利，1 项外观设计专利。其中“组合式直流变换器”专利已作价投资，实施专利转化。

In 2018, a total of 13 invention patents were granted, including 6 invention patents, 6 utility model patents, and 1 design patent. Among them, the "combined DC converter" patent has been invested, and patent conversion implemented.

发明专利 Patent	发明人（按顺序） Inventor (in order)	发明类型 Type	专利号 Patent No.
组合式直流变换器 A combined DC-DC converters	吕枫；周怀阳 Lv Feng; Zhou Huai-yang	发明专利 Invention	ZL201610267380.4
海洋装备配电线路接地故障监测系统 A ground fault monitoring system for marine equipment power distribution lines	吕枫；周怀阳 Lv Feng; Zhou Huai-yang	发明专利 Invention	ZL201610148460.8

海底仪器的微型压电能量原位收集装置 A micro thermoelectric energy in-situ harvesting equipment for subsea instruments	吕枫，杨帆，李杰，吴正伟，朱嘉宇，姜雅梅，周怀阳 Lv Feng et al.,	发明专利 Invention	ZL201610555566.X
海底仪器的微型热电能量原位收集装置 A micro piezoelectric energy in-situ harvesting equipment for subsea instruments	吕枫 ; 姜雅梅 ; 朱嘉宇 ; 李杰 ; 吴正伟 ; 杨帆 ; 周怀阳 Lv Feng et al.,	发明专利 Invention	ZL2016105126749
一种可用于原位检测海底热液流体中氢气含量的传感器 A sensor for in situ detection of hydrogen in hydrothermal fluids	季福武，周怀阳，杨群慧，吴正伟，王虎 Ji Fu-wu et al.	发明专利 Invention	ZL 2016 1 0161658.X
一种水下流体采集阀 An underwater fluid collecting valve	吴正伟 ; 周怀阳 ; 季福武 ; Wu Zheng-wei; Zhou Huai-yang ; Ji Fu-wu	发明专利 Invention	ZL201610203380.8
海洋观测设备耐压腔体内部的固定支架结构 A frame structure in the pressure-resistant chamber of ocean observation equipment	徐昌伟，徐小芳 Xu Chang-wei; Xu Xiao-fang	实用新型专利 Utility Model	ZL201721248401.4
水下基站进缆段防脱网锚害结构 A trawl against structure for the cable at entry position of underwater base station	吴正伟 ; 周怀阳 ; 吕枫 Wu Zheng-wei; Zhou Huai-yang; Lv Feng	实用新型专利 Utility Model	ZL201720916227.X
一种防生物附着装置 An underwater biofouling protecting device	吴正伟 ; 周怀阳 ; 吕枫 Wu Zheng-wei; Zhou Huai-yang; Lv Feng	实用新型专利 Utility Model	ZL201720914727.X
一种水下光学传感器防生物附着装置 An underwater biofouling protecting device for optical sensor	吴正伟 ; 周怀阳 ; 吕枫 Wu Zheng-wei; Zhou Huai-yang; Lv Feng	实用新型专利 Utility Model	ZL201720916389.3
水下湿插拔辅助结构 An auxiliary structure for wet mating of underwater plug	吴正伟 ; 周怀阳 ; 吕枫 Wu Zheng-wei; Zhou Huai-yang; Lv Feng	实用新型专利 Utility Model	ZL201720914136.2
一种水下膜渗透传感器防生物附着装置 An underwater biofouling protecting device for membrane penetration sensor	吴正伟 ; 周怀阳 ; 吕枫 Wu Zheng-wei; Zhou Huai-yang; Lv Feng	实用新型专利 Utility Model	ZL201720914628.1
带有操作界面的电脑 Computer with Operation Interface	周征宇，倪世一 Zhou Zheng-Yu; Ni Shi-yi	外观设计专利 Design	4592079

□ 外籍专家来访
Foreign experts visiting

美国得克萨斯大学 Jamie Austin 教授于 10 月 22 日至 11 月 11 日来访我实验室。Austin 教授曾担任 IODP-FORUM 主席。42 年来担任过包括大洋钻探航次在内三十多个航次的首席科学家，是美国最大海洋研究所 (Woods Hole) 唯一科学家董事，多次出任国际大洋钻探计划的领导职务，包括 ODP 代主席、IODP 过渡期主席、IODP 十年评估组组长等，近年来又出任 IODP 论坛主席，是几十年来国际大洋钻探的学术领导骨干、而又不脱离本身地球物理研究岗位的学者。受聘于“同济大学短期外国高端专家”项目，Austin 教授来访期间就中国联合美方等共同发起制定 IODP 新十年（2023-2033）的科学计划进行探讨，介绍国际发现计划的动态、下一代大洋钻探船技术等，还参加了本实验室在北京协同举办的中国大洋钻探二十周年学术研讨会。此外，来访期间还与相关课题组进行交流讨论，就同济大学牵头南海南部巽它陆架 IODP 钻探建议书的设计和撰写等事宜给出了很多具有建设性的建议。

Professor Jamie Austin from the University of Texas visited our laboratory from October 22nd to November 11th. Professor Austin served as the chairman of IODP-FORUM. For the past 42 years, he has served as the chief scientist of more than 30 expeditions including ocean drilling cruises. He is the sole scientist director of the largest ocean research institute (Woods Hole) in the United States. He has held many leadership positions in the International Ocean Drilling Program, including ODP Acting Chairman, chairman of the IODP transitional period, leader of the IODP 10-year evaluation team, and served as the chairman of the IODP Forum in recent years. As the academic leader of international ocean drilling for decades, however, he does not move away from his geophysical research. Prof. Austin accepted the offer of the “Tongji University Short-Term Foreign High-End Experts” program, and visited China to promote Sino-American collaboration on a scientific plan for the development of the IODP New Decade (2023-2033). During the visit, he introduced the dynamics of the international discovery program and the next generation of ocean drilling ship technology, etc. He also participated in the seminar on the 20th anniversary of China Ocean Drilling organized by the laboratory in Beijing. In addition, during the visit, he also exchanged discussions with relevant research groups, and gave many constructive suggestions on the design and writing of IODP proposals for drilling in the southern part of the South China Sea.

10 月 9 日至 25 日，美国俄亥俄州立大学 Byrd Polar and Climate Research Center 的 Leonid Polyak 教授来访，与王汝建课题组等开展学术探讨。

From October 9th to 25th, Prof. Leonid Polyak of the Byrd Polar and Climate Research Center of Ohio State University visited and discussed with Wang Rujian’s research group.

8 月 19 日至 11 月 30 日，荷兰乌德勒支大学教授、海洋高等研究院的讲座研究员 Gert Jan de Lange 教授来访，通过学术报告、专题讲座、强化培训班等多种方式与实验室科研人员和研究生进行海洋地球化学研究和论文写作等方面的交流与指导。

From August 19th to November 30th, Prof. Gert Jan de Lange, Professor of the University of Utrecht in the Netherlands and a Visiting Fellow at the Institute of Advanced Marine Research, visited the laboratory and gave lectures and intensive training courses to exchange discussions with lab members and graduate students and guide them to marine geochemical research and article writing.

柬埔寨海洋和海岸带保护司司长 Thay Chantha、副司长 Meas Rithy 一行于 11 月 18 日至 21 日来访我室，与我室刘志飞课题组交流展示双方的研究成果，探讨双方进一步的合作空间。

Thay Chantha, Director, and Meas Rithy, Deputy Director, of the Department of Marine and Coastal Protection of Cambodia, , visited our lab from November 18th to 21st, and exchanged research results with the team of Prof. Liu Zhifei and discussed further collaboration between the two sides.

10 月 15-17 日，意大利 Universit à Pegaso 的 Benedetto De Vivo 教授与意大利那不勒斯费德里克二世大学的 Stefano Albanese 教授分别来访，讨论意大利籍博士研究生的联合培养工作计划，双方拟在合作谅解备忘录的框架下进一步加强合作。

On October 15-17, Professor Benedetto De Vivo from Universit à Pegaso, Italy, and Professor Stefano Albanese from Federico II University in Naples, Italy, visited and discussed the joint training program for Italian doctoral students. The two sides intend to collaborate in the framework of the memorandum of understanding to strengthen further cooperation.

10 月 4 日至 11 月 3 日，法国 Laboratoire d‘Oc é anographie de Villefranche sur Mer (LOV) 研究所 Nathalie Vigier 研究员受实验室高级访问学者基金资助，来实验室开展学术交流与访问。她的主要研究领域包括非传统稳定同位素地球化学、化学风化、古海洋与古环境等。

From October 4th to November 3rd, Nathalie Vigier, a researcher at the Laboratoire d'Oc é anographie de Villefranche sur Mer (LOV) Institute in France, visited with financial support by the Laboratory Senior Visiting Scholars Fund to conduct academic exchanges. Her main research areas include non-traditional stable isotope geochemistry, chemical weathering, ancient oceans and paleoenvironment.

10 月 13 日至 12 月 3 日，加拿大不列颠哥伦比亚大学 Roger Francois 教授在实验室杰出访问学者基金资助下，来我室进行学术交流。他主要从事海洋生物地球化学，第四纪古海洋与古气候，地球化学示踪等领域的研究。目前担任 Deep-Sea Research 杂志副主编，2015 年当选为加拿大皇家科学院院士，2017 年当选为美国地球物理联合会（AGU）会士。

From October 13th to December 3rd, Professor Roger Francois of University of British Columbia, Canada, invited for academic exchanges funded by the Laboratory

Outstanding Visiting Scholars Fund . He is mainly engaged in marine biochemistry, Quaternary paleo-ocean and paleoclimate, geochemical tracer and other fields of research. Currently serving as Associate Editor of *Deep-Sea Research*, he was elected Fellow of the Royal Canadian Academy of Sciences in 2015 and Fellow of the American Geophysical Union (AGU) in 2017.

12 月 16-18 日，同济大学兼职教授，国际著名海洋地质学家 Bilal Haq 教授来访，并与汪品先院士和其他科研人员开展学术交流。17 日下午他以“The Mediterranean Messinian Evaporite Giant”为题做了精彩学术报告。

On December 16-18, Prof. Bilal Haq, an adjunct professor of Tongji University and an international renowned marine geologist, visited and exchanged academically with Academician Wang Pinxian and other researchers. In the afternoon of the 17th, he delivered a impressive academic presentation entitled "The Mediterranean Messinian Evaporite Giant".

□ 主办国际会议
Hosting an international conference

第五届“地球系统科学大会”
The 5th "Earth System Science Conference"

2018 年 7 月 2-4 日，实验室主办的第五届“地球系统科学大会”在上海召开。来自中国 180 余家单位的 1500 余名专家学者参加 36 个专题的研讨。地球系统科学大会是同济大学海洋学科着力打造的重要学术交流平台，两年一届，已连续举办五届，参会人员的规模和会议的学术影响力在不断扩大。大会的目标在于促进学科交叉，横跨圈层、穿越时空，推动海陆结合、古今结合、生命科学与地球科学结合、科学与技术的结合。在当前我国地球科学、尤其是海洋科学高速发展的背景下，大会的宗旨在于打造“陆地走向海洋、海洋结合陆地”的交流平台。

On July 2-4th, the fifth "Earth System Science Conference" hosted by the laboratory was held in Shanghai. More than 1,500 experts and scholars from more than 180 Chinese

institutions participated in 36 seminars. The Earth System Science Conference is an important academic exchange platform for Tongji University's marine sciences. It has been held consecutively for five times and the scale of participants and the academic influence of the conference are constantly expanding. The goal of the conference is to promote the interaction between disciplines, across the spheres, through time and space, and to promote the integration between land and sea, between the ancient and modern, between life science and earth science, and between science and technology. In the context of the rapid development of China's earth sciences, especially marine science, the purpose of the conference is to create a communication platform for scientific endeavours "from land to ocean and integrating ocean and land".

第九届亚洲海洋地质大会
ICAMG-9

10 月 10-12 日，国际海洋地球科学领域一次重要的学术盛会——第九届亚洲海洋地质大会（ICAMG-9）在同济大学召开。来自 24 个国家 140 多家海洋科技研究单位的 600 余名与会代表，开展热烈学术交流和专题研讨。

On October 10-12th, an important academic event in the field of international marine geosciences - the 9th Asian Marine Geology Conference (ICAMG-9) was held at Tongji University. More than 600 delegates from more than 140 marine science and technology research institutions from 24 countries attended and conducted heated academic exchanges and discussions in themed seminars.

本届会议由本实验室、国际大洋发现计划（IODP）中国办公室和国家自然科学基金委共同主办。亚洲海洋地质大会（ICAMG）于 1988 年由同济大学汪品先教授、现任海洋研究开发署（JAMSTEC）总裁 Asahiko Taira 教授和韩国首尔大学 Yong Ahn Park 教授共同发起。第一届亚洲海洋地质大会由同济大学主办，此后在日本东京、韩国济州岛、中国青岛、泰国曼谷、日本高知、印度果阿、韩国济州岛等地相继举办，已成为国际海洋科学领域最重要的系列学术大会之一。时隔 30 年，该系列会议重返同济大学，意义深长。会议期间还举办了亚洲海洋地质大会 30 周年纪念，中国大洋钻探 20 周年成就展和优秀学生海报颁奖等系列活动。

The conference was co-sponsored by the laboratory, the International Ocean Discovery Program (IODP) China Office and the National Natural Science Foundation. The Asian Marine Geology Conference (ICAMG) was co-sponsored in 1988 by Prof. Wang Pinxian from Tongji University, Professor Asahiko Taira, the current President of Japan Agency for Marine-Earth Science and Technology (JAMSTEC), and Professor Yong Ahn Park from Seoul National University. The first Asian Marine Geology Conference was hosted by Tongji University and has since been held in Tokyo (, Jeju Island, Qingdao, Bangkok, Kochi, Goa, and Jeju Island. It has become one of the most important academic conferences in the field of marine science. After 30 years, the conference

venue returned to Tongji University, which is of great significance. During the conference, commemorations of the 30th Anniversary of the Asian Marine Geology Conferenceand the 20th Anniversary Achievement Exhibition and the Awards for Outstanding Student Posters were held.

同济大学“第三届国际青年学者论坛”
The 3rd International Young Scholars Forum

2018 年 4 月 26-27 日，同济大学“第三届国际青年学者论坛”海洋与地球科学学院分论坛在同济大学海洋楼举行，来自国际知名学府及科研机构的 8 位优秀青年学者参加论坛并作了精彩的学术报告，共同探讨学科前沿热点问题。迄今为止，国重室已连续举办三届国际青年学者论坛，邀请海内外几十位青年才俊与会，日益集聚海洋科学与地球物理学科新生力量。

On April 26-27th, the “3rd International Young Scholars Forum” of Tongji University was held at the Ocean Building of Tongji University. Eight outstanding young scholars from internationally renowned universities and research institutions attended the forum and delivered academic reports to discuss hot issues at the frontiers of the discipline. So far, our laboratory has held three consecutive International Youth Scholars Forums, inviting dozens of young talents at home and abroad to attend the conference, and increasingly gather new forces in marine science and geophysics.

□ 全球招聘
Global Recruitment

2018 年海洋科学大会
2018 Ocean Sciences Meeting

2018 年 2 月 11 日 -16 日，2018 年海洋科学大会（2018 Ocean Sciences Meeting）在美国俄勒冈州波特兰市举行。海洋科学大会是两年一届的全球海洋科学领域最高层次的学术会议。国重室范代读教授、涂俊彪和高小丰一行 3 人参加会议并设立全球招聘展位，宣传国重室最新研究进展。

On February 20-16th, the 2018 Ocean Sciences Meeting was held in Portland, Oregon, USA. The Meeting is the biennial academic conference at the highest level in the global ocean sciences. Professor Fan Daidu, Tu Junbiao, and Gao Xiaofeng attended the meeting and set up a global recruitment booth to attract new talents and promote the latest research progress of our laboratory.

美国石油地质学家协会（AAPG）年度会议
American Association of Petroleum Geologists (AAPG) Annual Meeting

2018 年 5 月 20 日 -23 日，美国石油地质学家协会（AAPG）年度会议在美国盐湖城召开。国重室耿建华教授、朱伟林教授、邵磊教授和陈源珊一行 4 人参加会议并设立全球招聘展位，开展全球招聘宣讲、政策解读和面试，吸引了包括犹它大学、休

斯顿大学、西弗吉尼亚大学等近 50 余位海内外青年才俊。

On May 20-23th, the annual meeting of the American Association of Petroleum Geologists (AAPG) was held in Salt Lake City, USA. Prof. Geng Jianhua, Prof. Zhu Weilin, Prof. Shao Lei and Chen Yuanshan from the laboratory attended the meeting and set up a global recruitment booth to conduct global recruitment presentations, policy interpretations and interviews, attracting more than 50 young talents, including those from University of Utah, University of Houston, and University of West Virginia.

国际地球化学年会
Goldschmidt Conference

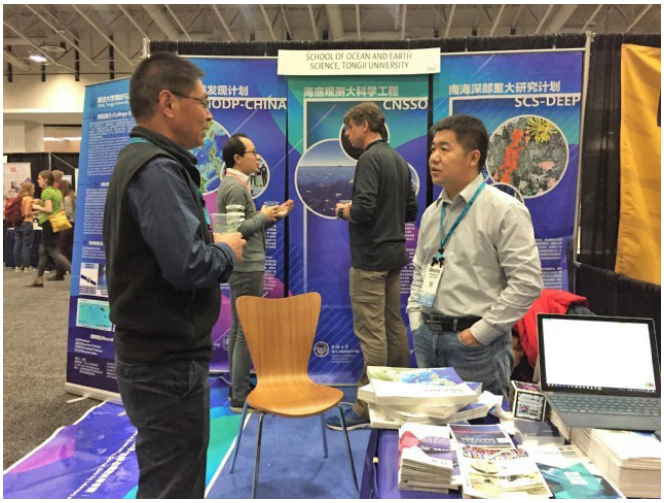
实验室在第 28 届国际地球化学年会 (Goldschmidt Conference) 上开展全球招聘活动。该会议是国际地球化学界的最高级别学术会议，汇聚了全球顶尖的地球化学家以及最前沿的研究成果。今年年会于 8 月 12-17 日在美国波士顿召开，吸引约 50 多个国家和地区的 3000 多名代表参加。国重室主任杨守业，副主任程昊等向国际青年人才和海外学者介绍了同济海洋学科发展现状，就人才政策、学科建设、人才需求和未来发展等问题做了解释，吸引了不少世界知名院校和研究生前来咨询。

The laboratory conducted global recruitment activities at the 28th Annual Goldschmidt Conference. The conference is the highest-level international conference for geochemistry, bringing together the world's top geochemists and cutting-edge research. This year's annual meeting was held in Boston, USA on August 12-17, attracting more than 3,000 delegates from more than 50 countries and regions. Yang Shouye, director of the National Heavyweight Office, and Cheng Hao, deputy director, introduced the recent development of Tongji marine discipline to international young talents and overseas scholars, and explained the issues of talent policy, discipline construction, talent requirements and future development, and attracted many well-known institutions and graduate students come for consultation.

美国地球物理联合会
American Geophysical Union Fall Meeting

12 月 10-14 日，美国地球物理联合会（American Geophysical Union，AGU）在美国华盛顿举行。来自全球 100 多个国家和地区的 2.8 万名专家学者和学生参加了本次会议。翦知湣院长、拓守廷副院长

及张钊、温廷宇等人参加会议并设立全球招聘展位，宣传我院引进人才的各项措施和政策，吸引国内外学者来我院工作或开展科研合作。此次展览重点介绍了学院目前主持的大洋钻探大科学计划、海底观测大科学工程和国家自然科学基金委“南海深部过程演变”重大研究计划等重要项目和平台。



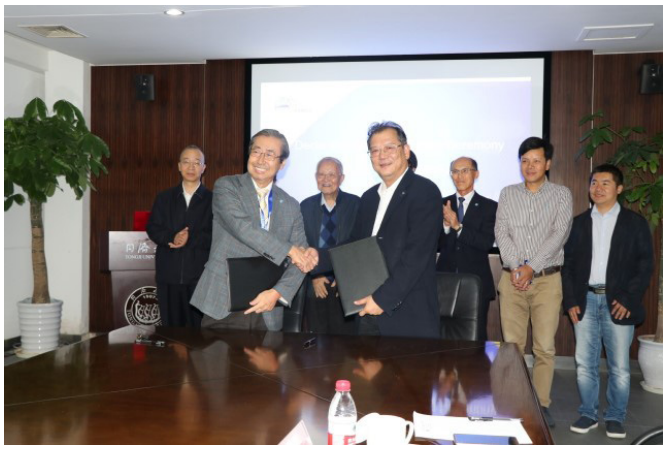
On December 10-14th, the American Geophysical Union (AGU) was held in Washington, DC. Over 28,000 experts, scholars and students from more than 100 countries and regions around the world attended the conference. Jian Zhimin, Dean of School, Tuo Shouting, Deputy Dean, Zhang Zhao and Wen Tingyu attended the meeting and set up a global recruitment booth to publicize the measures and policies for new talents , and attract domestic and foreign scholars to work in our school, or conduct research collaboration. The exhibition focused on important projects and platforms such as the Scientific Ocean Drilling Program, the Submarine Observation Science Project, and the National Natural Science Foundation's “SCS Deep Process Evolution” major research program.

□ 代表团来访
Delegation Visit

与日本国立海洋研究开发机构（JAMSTEC）签署意向性合作协议

Signed an intentional cooperation agreement with the Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

2018 年 10 月 11 日，同济大学与日本海洋研究开发机构（JAMSTEC）签订意向性合作协议签约。JAMSTEC 理事长平朝彦教授、国际事务部相关负责人出席。协议指出双方在海洋科技领域拥有共同的兴趣，特别是在大洋钻探等方面具有广泛的合作前景，未来将积极推动合作谅解备忘录的签署，以期加强双方在人员往来、项目合作、技术交流等各方面的合作。



On October 11th, Tongji University signed an intentional cooperation agreement with the Japan Agency for Marine-Earth Science and Technology ("JAMSTEC"). Prof. Asahiko Taira, Director of JAMSTEC, and the person in charge of the International Affairs Department attended the meeting. The agreement pointed out that the two sides have common interests in the field of marine science and technology, especially in the area of ocean drilling, and will actively promote the signing of the cooperation memorandum of understanding, in order to strengthen collaboration between the two sides in personnel exchanges, project cooperation, technical exchanges and other aspects.

与意大利那不勒斯费德里克二世大学续签合作谅解备忘录

Memorandum of Understanding for Renewal of Cooperation with the University of Naples Federico II, Italy

我实验室与意大利那不勒斯费德里克二世大学有着长期友好合作，双方于 2013 年 10 月签署了合作谅解备忘录，协议生效的 5 年来，双方在科学研究与人才培养等领域开展了多项合作。10 月份，同济大学续签了双方的合作谅解备忘录。

Our laboratory has long-term friendly cooperation with the University of Naples Federico II. The two sides signed a memorandum of understanding on cooperation in October 2013. In the past five years since the agreement came into effect, the two sides have carried out many collaborations in the fields of scientific research and personnel training. In October, Tongji University renewed the memorandum of understanding on cooperation between the two parties.

inter-school cooperation agreement. The two sides will strengthen cooperation and exchanges in many aspects such as marine research and promote the exchange of teachers and students between the two sides, in order to lift the overall level of international cooperation and exchanges.

与罗格斯大学签订了校际合作协议

Signed an inter-school cooperation agreement with Rutgers University

罗格斯大学副校长 Eric Garfunkel 教授于 1 月来访我室，就双方在深海研究领域的进一步合作进行磋商。去年 11 月，由伍江常务副校长代表同济大学、Barbara A. Lee 副校长代表罗格斯大学，双方签订了校际合作协议，双方将加强在海洋研究等诸多方面的合作交流，促进两校之间的教师和学生交流，整体提升双方的国际合作交流水平。

Professor Eric Garfunkel, Vice President of Rutgers University, visited our lab in January to discuss further cooperation between the two sides in the field of deep sea research. In November 2017, Vice President Wu Jiang representing Tongji University and Vice President Barbara A. Lee representing Rutgers University signed an

□ 留学生
International Students

留学生游学活动
Study Tour

2018 年 11 月 5-8 日，我实验室组织我校 10 名获得中国政府海洋奖学金资助的留学生受邀赴位于青岛的中国海洋大学参加了四天的游学活动。本次活动由自然资源部国际合作司主办，中国海洋大学承办。海洋科学专业博士二年级学生吴默向在座师生汇报了自己出海进行科学考察的经历及相关研究工作，与同学们分享了出海的准备和经验。这些国际学术交流极大丰富了他的视野，为他今后从事科研工作打下了良好基础。

On November 5-8th, the laboratory organized 10 international students who were supported by the Chinese Government Ocean Scholarship to participate in a four-day study tour to Ocean University of China in Qingdao. The event was jointly hosted by the Department of International Cooperation of the Ministry of Natural Resources and Ocean University of China. Wu Moxiang, a second-year Ph.D. student in marine science, reported to the teachers and students about his experience in scientific research and related research work, and shared his preparations and experience with the students. These international academic exchanges have greatly enriched his vision and laid a good foundation for his future research work.

□ 2018 年度开放课题资助清单
2018 Open Project Funding List

课题编号 Project No.	申请人 Applicant	职称 Title	工作单位 Affiliated Institution
MGK1801	Leonid Polyak	Senior Research Scientist	Ohio State University
MGK1802	Allan Gil	Assistant Professor	University of the Philippines
MGK1803	李玉洁 Li Yu-jie	讲师 Lecturer	九州工业大学 Kyushu Institute of Technology
MGK1804	王雨楠 Wang Yu-nan	助理研究员 Assistant Researcher	上海自然博物馆（上海科技馆分馆） Shanghai Natural History Museum (Shanghai Science and Technology Museum Branch)
MGK1805	张一歌 Zhang Yi-ge	Assistant Professor	Texas A&M University

MGK1806	马小林 Ma Xiao-lin	博士后 Post-doctor	中国科学院地球环境研究所 Institute of Earth Environment, Chinese Academy of Sciences
MGK1807	王张华 Wang Zhang-hua	教授 Professor	华东师范大学河口海岸研究院 East China Normal University Estuary and Coastal Research Institute
MGK1808	杨积忠 Yang Ji-zhong	Research Fellow	National University of Singapore
MGK1809	Daniel Franco	Assistant Professor	National Observatory in Brazil
MGK1810	Niteshkumar N. K	Scientist B	Birbal Sahni Institute of Palaeosciences
MGK1811	叶丰 Ye Feng	助理研究员 Assistant Researcher	中国科学院广州地球化学研究所
MGK1812	Xiao-Ming Liu	Assistant Professor	University of North Carolina at Chapel Hill
MGK1813	Foong Swee Yeok	Senior Lecturer	School of Biological Sciences, Universiti Sains Malaysia
MGK1814	Hantoro	Professor	Research Center for Geotechnology, Indonesian Institute of Sciences
MGK1815	刘喜停 Liu Xi-ting	副教授 Associate Professor	中国海洋大学 Ocean University of China
MGK1816	孔凡圣 Kong Fan-sheng	副研究员 Associate Researcher	国家海洋局第二海洋研究所 Second Institute of Oceanography, State Oceanic Administration
MGK1817	仲 义 Zhong Yi	博士后 Post-doctor	南方科技大学海科学与工程系 Department of Marine Science and Engineering, Southern University of Science and Technology
MGK1818	于海英 Yu Hai-ying	副研究员 Associate Researcher	上海市地震局 Shanghai Earthquake Administration

交流与合作
COMMUNICATION AND COLLABORATION

□ 访问学者基金
Visiting Fellowship

2017 年 6 月设立并发布访问学者申请指南，包括“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”，并制定一系列管理规定办法。访问学者基金主要用于支持国内外知名学者前来实验室开展学术活动，鼓励双方加强学术交流与合作。2018 年共批 3 项杰出访问学者基金，4 项高级访问学者基金，3 项青年访问学者基金。

In 2017 June, a guide for visiting scholars funding was established and published, including the “Distinguished Visiting Fellowship”, the “Senior Visiting Fellowship” and the “Young Scientist Visiting Fellowship”, and a series of management regulations were formulated. The Visiting Fellowship Program is mainly used to support well-known scholars at home and abroad to come to the laboratory and carry out academic activities so to encourage both sides to strengthen academic exchanges and cooperation. In 2018, a total of 3 Distinguished Visiting Fellowship, 4 Senior Visiting Fellowship and 3 Young Scientist Visiting Fellowship were awarded.

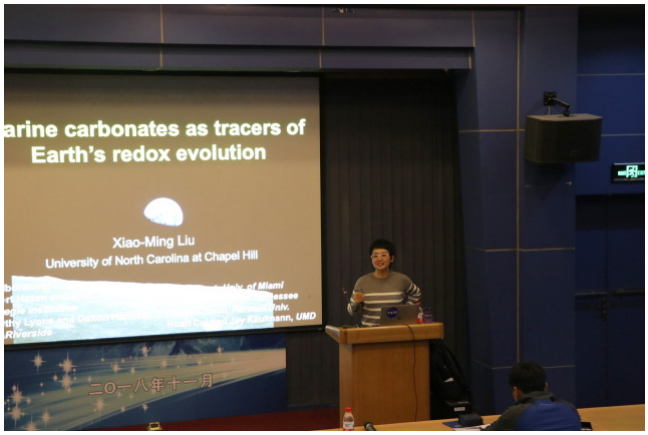
2018 年访问学者基金获得者名单
Recipient of the 2018 Visiting Fellowship Program

序号 No.	学者姓名 Name of Scholar	职位 Position	工作单位 Affiliated Institution
Distinguished Visiting Fellowship			
VF201802	Roger Francois	Professor	University of British Columbia
VF201804	Gert J. de Lange	Professor	Utrecht University
VF201805	Gabriel Bowen	Professor	University of Utah
Senior Visiting Fellowship			
VF201803	Nathalie Vigier	Professor	CNRS, France
VF201806	Wu Yong-sheng	Senior Research Scientist	Bedford Institute of Ocean-ography
VF201808	Martin Wiesner	Professor	Hamburg University
VF201809	Benjamin Kneller	Professor	University of Aberdeen
Young Scientist Visiting Fellowship			
VF201801	Liu Xiao-ming	Assistant Profes-sor	University of North Carolina
VF201807	Yang Shao-hua	Assistant Profes-sor	Institute of Geology, Chinese Academy of Geological Sci-ences.
VF201810	Luo Yi-ming	Professor	Sun Yat-sen University

□ 蓝海论坛
Ocean Fest

自 2017 年 4 月开设蓝海论坛，2018 年共举办 14 场蓝海论坛，邀请海内外近 40 位学者围绕但不局限于大洋钻探、南海专题、海底观测、名家讲座、新人卓见等交流讨论，促进学术交流，加强国际合作。

Since the opening of the Blue Ocean Forum in April 2017, a total of 14 Blue Ocean Forums have been held in 2018, and nearly 40 scholars at home and from abroad have been invited to exchange ideas on, but not limited to, ocean drilling, SCS topics, seabed observations, distinguished lectures, and insight of newcomers for exchange and strengthen international cooperation.



交流与合作
COMMUNICATION AND COLLABORATION

期次 No.	论坛主题 Topic	召集人 Convener
17#	Fates(宿命）计划发展策略及历史	范代读
18#	Unfinished business: the tropical Pacific in the warm Pliocene and Miocene	田军
19#	Coastal Dynamics and Oceanography: from Observations to Modelling	范代读
20#	空间科学之新人卓见	韩德胜
21#	黄东海海洋科学多学科交叉研讨会	范代读
22#	新生代赤道太平洋的暖水上涌	刘传联
23#	Tide-dominated river deltas:recent research progress	杨守业
24#	Overview and recent advances in the interpretation of Eastern Mediterranean organic-rich unit sapropel S1 (10-6 ka BP): its redox-controlled formation, preservation, and interruption	刘志飞
25#	Carbonate platform slope sedimentology and stratigraphy. Seismic and sedimentological characteristics of a delta drift: a new carbonate drift type.	钟广法
26#	The thermochemical structure of the lithosphere in space and time: New concepts for characterization and resource exploration	柳畅
27#	Scientific Ocean Drilling: Past, Present and Future	田军
28#	Hotspot motion created the Hawaiian-Emperor Bend and LLSVPs are not fixed	赵西西
29#	The Atlantis Massif and the Lost City hydrothermal field	周怀阳
30#	Deep Mediterranean's Evaporite Giant: How much Salt?	汪品先

□ 奖学金
Scholarships

海洋地质奖学金
“Marine Geology” scholarship

为鼓励学生努力学习，帮助学生成长成才，海洋地质国家重点实验室设立“海洋地质”奖学金。奖学金针对全院学生，本科生、研究生均可申请。2018 年，共有 8 名学生获得了“海洋地质”奖学金，其中本科生 5 人，研究生 3 人。

In order to encourage students to study hard and help students grow into talents, the National Key Laboratory of Marine Geology has established a “Marine Geology” scholarship. Scholarships are available to all undergraduate and postgraduate students. In 2018, a total of 8 students received the “Marine Geology” scholarship, including 5 undergraduates and 3 graduate students.

□ 学生教育
Student Education

暑期学校
Summer School

实验室每年举行“全国优秀大学生暑期学校”，通过深海科普馆与重点实验室参观、学科介绍、专业测试、面试交流等多种形式开展，加强各高校优秀在校大学生对实验室相关学科及科研状况的了解，吸引更多全国优秀本科毕业生报考海洋研究生。自 2012 年至今，已成功举办 7 届暑期学校。2018 年，实验室招收来自全国 17 所高校的优秀学员共计 35 人，2019 年研究生招生过程中已推免录取其中 9 人。

Each year, the laboratory holds the National Summer Student Program for Outstanding Undergraduate Students, which is conducted in various forms such as visits to deep sea science museums and key laboratories, subject introductions, professional tests, and interviews and exchanges, in order to strengthen the understanding of outstanding university students about lab-related disciplines and scientific research progress in our laboratory. The program has attracted more and more outstanding national undergraduates to apply for marine graduate studies in the lab. Since 2012, seven summer schools have been successfully held. In 2018, the laboratory accepted 35 outstanding students from 17 domestic universities to participate in the program. In the course of the graduate enrolment process for 2019, 9 students who were program participants were admitted.

研究生学术论坛
Graduate Academic Forum

2018 年上海地球系统科学研究生学术论坛
2018 Shanghai Earth System Science Research Academic Forum

2018 年 7 月 1 日，来自全国各大院校和科研院所的青年学子齐聚上海，参加“2018 年上海地球系统科学研究生学术论坛”，共同聚焦沉积、古环境、物理海洋、海洋生物、地球动力、构造、石油地质与海洋化学七大重要地球科学议题，分享最新研究成果与思考。论坛由同济大学海洋与地球科学学院、海洋地质国家重点实验室共同举办。

On July 1st, young students from universities and research institutes across the country gathered in Shanghai to participate in the "2018 Shanghai Earth System Science Research Academic Forum" to focus on sedimentation, paleoenvironment, physical oceans, and marine life, The seven major earth science issues of Earth Dynamics, Structure, Petroleum Geology and Ocean Chemistry share the latest research findings and reflections. The forum was jointly organized by the School of Ocean and Earth Science and the State Key Laboratory of Marine Geology, Tongji University.

博思论坛
Boss Forum

2018 年 5 月及 12 月，海洋地质国家重点实验室举办了两次研究生论坛，主题分别为“感悟世界”和“海纳百川，共化未来”。论坛每次由 4 位研究生围绕主题作报告，同时邀请相关领域的导师做评审。论坛为研究生提供了良好的交流学术和展现科研成果的平台，激发了学生学术思想的创新和投身科研的热情。

In May and December 2018, the State Key Laboratory of Marine Geology held two postgraduate forums with the theme of “Inspire World” and “All rivers into Sea, Co-integrating into the Future”. Each time the forum is run by having four graduate students to talk around a topic, and the instructors in related fields are invited to conduct the review. The forum provides a good platform for graduate students to exchange academics and demonstrate scientific research results, which will stimulate students’ innovative ideas and their enthusiasm for scientific research.

深海科学科普教育基地在 2018 年，共接待约 32303 人次参观学习，其中团体参观 16318 人，共约 300 余团次。“深海科学馆”以全新的面貌重新开放。开放首展的主题聚焦在深潜、深网、深钻。通过展示我国和国际科学家在海底观测网建设，载人和无人深潜器，以及大洋钻探计划等的发展历程和取得的成果，深入浅出地向参观者呈现我国关心海洋、认识海洋、经略海洋，推动海洋强国建设不断取得的新成就。

In 2018, the deep-sea science education base received a total of 32,303 visits, including 16,318 people from 300+ groups. The Deep Sea Science Museum reopened with a new look with its first themed exhibition on deep dive, deep net and deep drilling. By demonstrating the development history and achievements of the construction of submarine observation networks, manned and unmanned deep submersibles, and ocean drilling programs by Chinese and international scientists, we can present to our visitors the China′s concern for the ocean, the understanding of the ocean, and its strategic development. All this will help to promote the construction of a strong ocean nation and continuously achieve new achievements.

今年的“全国科普日”，实验室主办“走进蔚蓝、探索深海—海洋知识科普展”。从生命起源，到航海探险，从深海科考，到海洋强国，此次海洋知识展，带市民领略我们所未知的蔚蓝世界。全年近 50 多所市内外中小学和少儿机构与我们深海科学科普教育基地建立了良好和深厚的馆校合作关系。

For the 2018 "National Science Day", the laboratory also hosted "Into the Blue, Explore the Deep Sea - Ocean Knowledge Science Exhibition". From the origin of life to sailing expeditions, from deep-sea sciences to ocean powers, this marine knowledge exhibition guides the public to appreciate the little-known blue world. Nearly 50 primary and secondary schools and children’s institutions

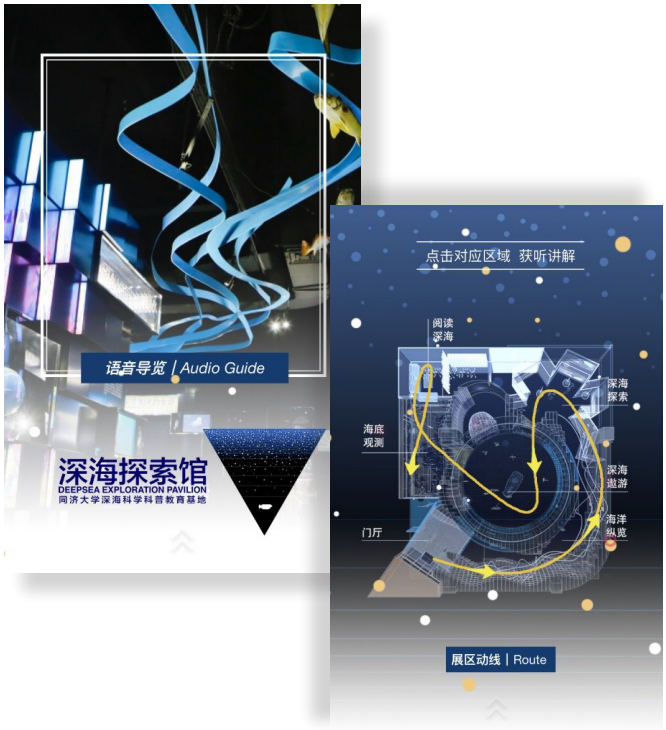
科普教育
SCIENCE POPULARIZATION

in and outside the municipality have established a good and profound collaborative relationship with our science education base.

2018 年上海书展，海洋与地球科学学院汪品先院士主编深海系列丛书新书首发，全套 6 册深海探索系列丛书图文并茂，轻松科普。发布现场汪院士带着这套新书与新闻晨报的小记者团一起分享了深海科学的探索经历。

At the 2018 Shanghai Book Fair, a series of new books on the deep sea edited by Academician Wang Pinxian of the School of Ocean and Earth Sciences were launched. The complete set of 6 deep sea exploration book series is well illustrated and easy to popularize. On the scene, Prof. Wang shared the exploration experience of deep sea science in these new books with a junior reporter group from the Morning News press.

在原深海科学科普教育网站的基础上，丰富内容，微信公众号同步更新了板块和展示方式。在公众号内增加了语音导览模块，方便个人参观以及没有提前预约的市民也能随时在我们科普馆内听到专业的讲解。



The deep-sea science education website was revised and enriched with new contents, and the sections and presentation methods on the WeChat public account were updated. An audio guide module has also been added to the public address to facilitate personal visits to our science museum and citizens who have not made advance bookings can also hear professional explanations at site.

在现有的基础上丰富科普场馆主题活动，加深

科普、教育同行间的交流和合作；重点追踪科学热点事件的科普报道，建立并推广海洋科普专题网站，丰富公众号与市民的互动模式和形式，设计制作寓教于乐的科普场馆周边文创产品和纪念品，着力科普基地的临港三期工程。

The Deep Sea Discovery Center enriches the theme activities of popular science venues on the basis of the existing ones, deepens the exchanges and cooperation between science popularization and educational peers; focuses on tracking scientific reports on scientific hot events, and establishes and promotes marine science topics. The website enriches the interaction mode and form of the public number with the public, designs and produces cultural and creative products and souvenirs around the popular science and technology venues, and focuses on the third phase of the Lingang base.

分析室
OVERVIEW OF LABORATORIES

新开放分析室
Newly Open Labs

2018 年实验室陆续对外开放了比表面与气体吸附分析室、岩石物理分析室两个分析室。

比表面与气体吸附分析室拥有一台 PCTPro 高温高压气体吸 / 脱附分析仪和一套乙二醇乙醚吸附装置。PCTPro 高温高压气体吸 / 脱附分析仪能够检测固体材料在不同温温度（T）、压力（P）条件下的气体等温吸 / 脱附特征。乙二醇乙醚吸附装置主要用于检测无机矿物、沉积物（岩）等固体材料的总表面积。配合低温氮气吸附检测的外表面积，可以获得固体材料的内表面积。

岩石物理分析室 SCMS-F 型高 / 低温高压岩芯多参数测量仪器，该仪器由实验室与西南石油大学国家重点实验室联合研制，属新型全自动岩芯测量系统，拥有测量参数多，精度高及自动化能力强等特点。同时分析室还配有相应的岩芯钻取设备，加工装置及饱和装置等设备，能够满足岩石物理测试要求。

In 2018, the laboratory opened two analysis rooms, namely the surface and gas adsorption analysis chamber and the petrophysical analysis chamber.

The surface and gas adsorption analysis chamber has a PCTPro high temperature and high pressure gas suction/desorption analyzer and a set of ethylene glycol ether adsorption unit. The PCTPro high temperature and high pressure gas absorption/desorption analyzer is capable of detecting the isothermal absorption/desorption characteristics of solid materials under different temperature (T) and pressure (P) conditions. The ethylene glycol ether adsorption device is mainly used for detecting the total surface area of solid materials such as inorganic minerals and sediments (rocks). The internal surface area of the solid material can be obtained by the external surface area detected by the low temperature nitrogen adsorption.

The petrophysical analysis chamber has a SCMS-F high/low temperature high pressure core multi-parameter measuring instrument. The instrument is jointly developed by the laboratory and the State Key Laboratory of Southwest Petroleum University. It is a new type of fully automatic core measuring system with more measurement parameters of high precision and strong automation. At the same time, the analysis room is equipped with corresponding core drilling equipment, processing equipment and saturation equipment to meet the requirements of petrophysical analysis.

人员情况
STAFF MEMBERS

基本情况
General Information

至 2018 年底，实验室共有科研人员 63 人，客座教授 1 人，实验和工程技术人员 12 人，科研助理 3 人，以及行政管理人员 9 人。目前实验室在读硕士生 146 人、博士生 123 人、留学生 20 人，博士后在站 24 人。

国重室在 2018 年度的人才引进和培养上有较大突破，取得了丰硕的成果。田军教授获“第五届曾呈奎海洋科技奖”青年科技奖，王本峰研究员入选中国科协“青年人才托举计划”。引进了德国籍 Martin Wiesner 讲座研究员、王本锋研究员以及陈琼助理教授等。Martin Wiesner 博士是国际知名的地质学家、生物地球化学家，他的主要研究兴趣集中在海洋表层沉积物中有机质的赋存、氧化及成岩作用。他曾担任德国“太阳号”、中国“向阳红 5 号”、“向阳红 14 号”等科考船的共 12 个国际科学考察航次的（联合）首席科学家。他的加盟，将大大推进国重室在沉积学及生物地球化学方面的研究。青年学者王本峰、陈琼博士，以及陈璞皎等 13 位博士后加入海洋科学 / 地球物理学博士后流动站，显著提高了国重室的学术研究活力。此外，国重室还聘用了王军建等科研 / 行政助理，进一步加强了国重室支撑队伍建设。

为促进国际交流与合作，吸引优秀外国留学生攻读海洋与地球科学学院相关研究生专业的学历和学位，由国重室出资设立了外国留学生奖助金，用于资助攻读学位的外国留学生。2018 年度获得资助的留学生共有 10 人，其中博士 7 人，硕士 3 人，分别来自埃及、泰国、马来西亚、印度尼西亚及缅甸等国家。

国重室还积极支持本学科的研究生出国短期学术交流。这些研究生通过国外的学习交流，不仅取得了较好的科研数据，还锻炼和培养了独立科研和国际学术交流能力，进一步促进国重室的人才培养和队伍建设。

国重室每年举办大学生暑期学校，通过深海科普馆与国重室参观、学科介绍、专业测试、面试交流等多种形式开展，加强各高校优秀在校大学生对国重室相关学科及科研状况的了解，吸引更多全国优秀本科毕业生报考海洋研究生。

学位授予方面，目前设有 2 个博士点，4 个硕士点。以国重室研究人员为第一导师，2018 年毕业博士研究生为 22 人，毕业硕士研究生为 48 人。

By the end of 2018, the laboratory had a total of 63 researchers, 1 visiting professor, 12 analytical and engineering technicians, 3 research assistants, and 9 administrative staff. At present, there are 146 master students, 123doctoral students, 24 international students, and 21 post-doctoral fellows.

The State Key Laboratory of Marine Geology made a major breakthrough in the introduction and training of talents in 2018 and achieved fruitful results. Professor Tian Jun was awarded the Youth Science and Technology Award of the “5th Zeng Chengkui Ocean Science and Technology Award”. Researcher Wang Benfeng was selected as the “Young Talents Lifting Plan” of the China Association for Science and Technology. Introduced Martin Wiesner lecture researcher from Germany, researcher Wang Benfeng and assistant professor Chen Qiong. Dr. Martin Wiesner is an internationally renowned geologist and biogeochemist. His main research interests focus on the occurrence, oxidation and diagenesis of organic matter in marine surface sediments. He served as the chief scientist of a total of 12 international scientific expeditions in the German "Sun", Chinese "Xiangyanghong 5", "Xiangyanghong 14" and other scientific research vessels. His joining will greatly advance the research of sedimentology and biogeochemistry in our lab. Young scholars Dr. Wang Benfeng, Dr. Chen Qiong, and Dr. Chen Yu as well as other 13 postdoctoral fellows joined the postdoctoral station of marine science/geophysics, which significantly improve the academic research vitality of the lab. In addition, the Laboratory also hired Wang Junjian and other research/administrative assistants to further strengthen the construction of the supporting team.

In order to promote international exchanges and cooperation, and attract outstanding foreign students to study for higher qualifications and degrees of postgraduate majors in the School of Ocean and Earth Sciences, the State Key Laboratory of Marine Geology has established a foreign student scholarship to support them. In 2018, 10 international students received

the funding, including 7 doctoral and 3 master students from Egypt, Thailand, Malaysia, Indonesia and Myanmar.

The State Key Laboratory of Marine Geology also actively supports the short-term academic exchanges of graduate students. Through overseas study and exchange, these graduate students not only obtained good scientific research data, but also exercised and cultivated independent scientific research and international academic exchange ability, and further promoted the talent training and team building of the laboratory.

Each year, the State Key Laboratory of Marine Geology holds summer schools for college students. It is carried out through various forms such as deep sea science museum and Laboratory visits, subject introduction, professional testing, and interview exchanges, to strengthen the understanding of the excellent subjects and scientific research status of our lab by top-grade students of other universities. This will attract more outstanding undergraduate graduates to apply for graduate studies of marine science.

There are currently 2 doctoral programs and 4 master programs, with the researchers of the State Key Laboratory of Marine Geology are the first mentor. In 2018, 22 doctoral students and 48 master students graduated.

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Yang Shou-ye, Zhou Huai-yang, Jian Zhi-min, Liu Zhi-fei, Liu Chuan-lian, Wang Ru-jian, Fan Dai-du, Tian Jun, Xu Chang-hai

人才计划、晋升与奖项
Talent, Promotion and Awards

田军教授获“第五届曾呈奎海洋科技奖”青年科技奖

Professor Tian Jun won the "5th Zeng Chengkui Ocean Science and Technology Award" Youth Science and Technology Award

王本锋入选中国科协“青年人才托举计划”（32 岁以下）

Wang Ben-feng was selected as the “Young Talents Lifting Plan” (under 32 years old) of China Association for Science and Technology

陈璞皎、连尔刚入选 2018 年上海市“超级博士后”激励计划

Chen Pu-jiao and Lian Er-gang were selected for the "Super Postdoctoral" Incentive Program in Shanghai in 2018

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