

**TOGETHER,
WE BUILD WHAT MATTERS**

2025
MEL



Introduction

Established in March 2005, the State Key Laboratory of Marine Environmental Science (Xiamen University) (MEL) is sponsored by the Ministry of Science and Technology (MOST). It was rated among the best state key laboratories in the last two MOST nation-wide reviews (2010 and 2015). Currently, it has 81 faculty members, 106 technicians and research assistants, 9 research scientists, and 8 administrative staff.

Goal and Mission

- Pursue academic excellence
- Address national and societal needs
- Build a world-class team
- Develop to be a talent hub
- Foster international collaborations
- Achieve organizational excellence



Organization

Honorary Director:

Huasheng HONG, Minhan DAI

Director:

Dalin SHI

Deputy Director:

Yao ZHANG, Zhiyu LIU, Zhimian CAO

Jian MA, Congkui YE



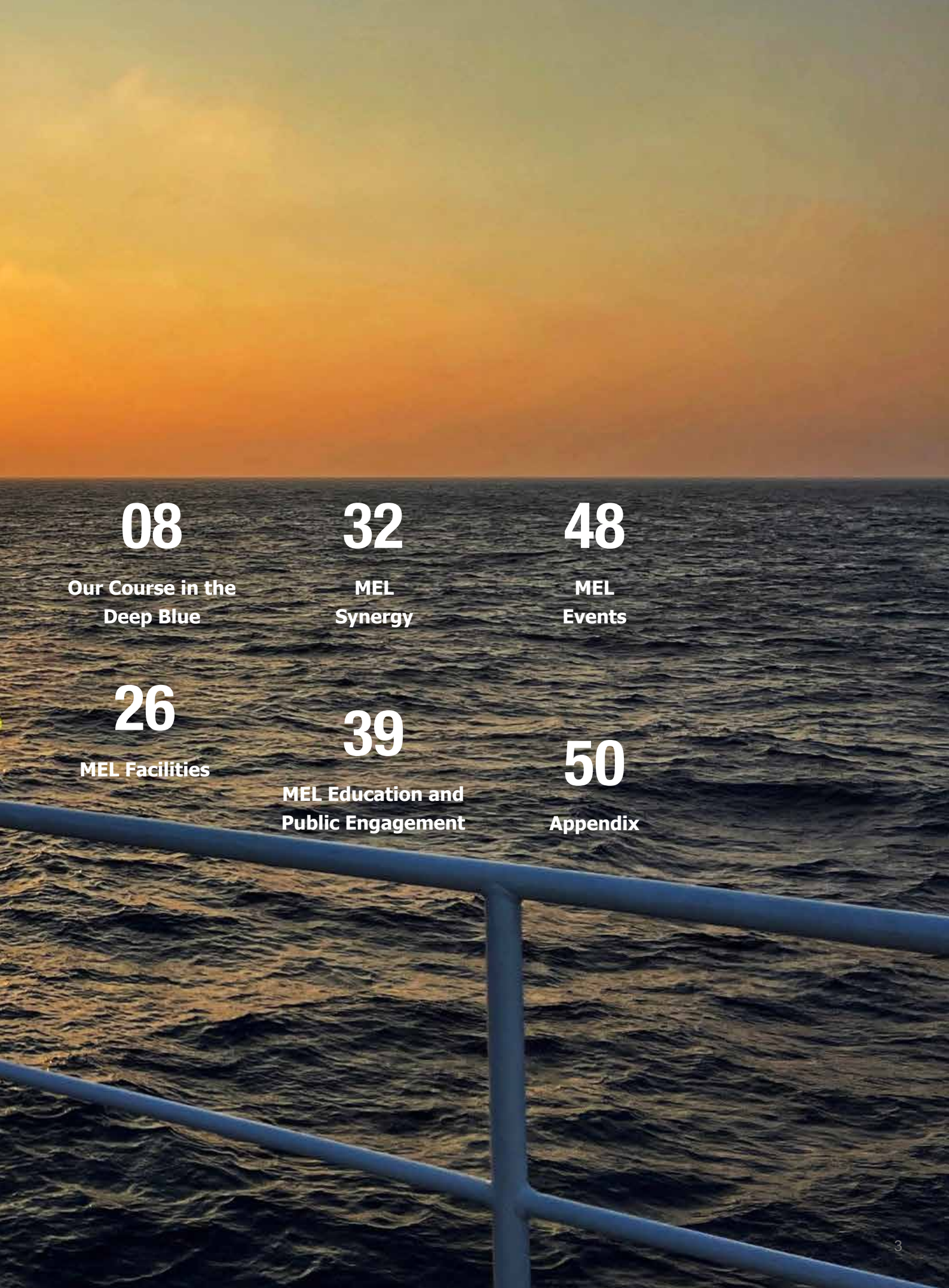
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A full-page background image showing a sunset over the ocean. The sky is a gradient of orange and yellow, transitioning into a deep blue at the horizon. The ocean surface is dark with small, choppy waves. In the foreground, a blue metal railing of a ship's deck runs diagonally across the frame, adding a sense of perspective and being part of the overall composition.

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Message from Director

A JOURNEY OF A THOUSAND MILES

As the year draws to a close, we look back on a landscape of renewal. In January 2025, the State Key Laboratory of Marine Environmental Science (MEL) completed its restructuring, formally stepping into a new chapter of development. This marks far more than a mere name change; it represents a transformation towards national strategic needs, realigning our research priorities and sharpening the focus on our core mission.

Growth is never an instantaneous "singularity," nor is it the work of a single day or isolated steps. Looking back, the journey we have traveled stretches well beyond a thousand miles. This path has been paved by the sustained efforts of generations, collective wisdom, and the conscious mission to serve our nation and respond to the call of our times.

Our Course in the Deep Blue

Restructuring is not an endpoint, but a call to refocus our mission and redefine our direction. The International Strategic Advisory Committee Meeting and Internal Strategic Planning Workshop has helped us chart our future course: to address the core scientific question of "the interaction between the ocean carbon cycle and climate change," focusing on the key mission of marine biogeochemistry and ocean carbon sinks. Within this framework, we have optimized our research layout, shifting to organized, systematic, and collaborative research. The launch of the NSFC Major Research Plan on "Evolution and Tipping Dynamics of Complex Coastal Zone Systems," with a MEL leading scientist chairing its expert panel, further demonstrates the MEL's leadership and proactive commitment at the interdisciplinary frontier of Earth science.

Our Foundation, Our People

Grand visions can only be realized with people. Our leading scientists were honored with the "Fujian Provincial Science and Technology Major Contribution Award (2025)," while others excelled in national and provincial talent programs. A cohort of outstanding young talents joined us, injecting vibrant new energy. Eleven scholars were named among Elsevier's "Most Cited Chinese Researchers in 2024," and many members have assumed key roles in global bodies including the Global Future Council of World Economic Forum, the SOLAS Scientific Steering Committee, the Asia-Oceania Geosciences Society, and the Chinese Society for Oceanology and Limnology - collectively affirming MEL's growing influence at the frontiers of marine science and global ocean governance.

Our Fruits of Discovery

The essence of science lies both in exploring the profound and applying it to practical use. This year, we have systematically revealed the significant impacts of processes such as the low-latitude ocean mixed-layer pump, the reactivity of deep-sea dissolved organic carbon, and carbon flux variations in macroalgal cultivation areas on the global carbon cycle. Focusing on ecosystem responses, we elucidated the differential regulatory mechanisms of climate oscillations, extreme events, and ocean acidification on phytoplankton community structure and primary productivity. In element cycling, we made breakthrough advances in tracer methodologies and quantitative assessments of trace metals, nutrients, and nitrogen fixation processes, expanding our systematic understanding of carbon remineralization and material transport in the mesopelagic zone. We explored efficient carbon sequestration by microalgae and its coupled application with new materials, contributing to the release of China's first international standard on macroalgal carbon footprint accounting. Relevant findings have been published in top-tier journals including *Science Advances*, *National*



Science Review, *Nature Communications*, *PNAS*, and *Limnology and Oceanography*, and were selected for the “Top 10 Science and Technology Advances in Oceanology and Limnology (2024).”

Our Strength in Shared Purpose

In facing the shared challenges of global change and sustainable development, open collaboration remains fundamental to our ethos, as humanity faces a common future. This past year, we organized multiple side events at the UN 2025 Ocean Conference, driving innovative practices in governance frameworks and regional solutions under major international scientific programs. The 2025 Xiamen Symposium on Marine Environmental Sciences attracted over 1,700 scholars from 36 countries and regions, while the Global Chinese Marine Science Symposium launched in Kuala Lumpur, Malaysia, marked a milestone in our high-level academic exchange platforms. Furthermore, we have established and deepened strategic partnerships with leading research institutions across multiple nations, weaving a tighter, more responsive global network of cooperation.

Passing our Torch Forward

Our mission is to nurture the next generation—illuminated by science, driven by curiosity, and fueled by passion. In 2025, MEL hosted the “Climate Change & Ocean Health” Summer School and was again approved for the International Joint Training Program for Innovative Talents, continuously refining our talent cultivation system and providing clearer pathways for students and young scholars. Simultaneously, through publishing the textbook *18 Lectures on Ocean Culture*, hosting the “Au Bord de L’eau” ocean-themed event series, and enhancing our Ocean Sciences Day, we persistently advance communication and public engagement, building solid bridges connecting science with the public.

The future may be unwritten, but its foundation is being laid today—by every ordinary, resolute moment, and through our shared effort to shape the future with sincerity and hope. Between the dawns and dusks lie the perseverance and commitment of every researcher, technician, and administrative staff member who support MEL. It is this very diligence and vigilance that creates a solid foundation in the present and renders the blueprint for our future ever more luminous and attainable. That is what MATTERS.

With the turn of the seasons, a new blueprint unfolds. This report is dedicated to every act of dedication and to the trust we have shared. A journey of a thousand miles continues, step by steady step. Let us take 2025 as our new bearing and, guided by our renewed mission, pull together at the oars, rowing in unison toward the vast frontiers of blue science.

A handwritten signature in white ink, appearing to read 'Dalin Shi', is placed over the background image of a river winding through a field.

Prof. Dalin SHI
Director of MEL
December 31st, 2025

2025 Figures



Research Progress and Funding

53

Newly Funded Projects

1

NSFC Key Program

2

NSFC International (Regional) Cooperation and Exchange Programs

2

NSFC Young Scientists Fund (A)



Education

1

NSFC Young Scientists Fund (B)

769

Enrolled Postgraduates

129

Graduates

22

Postdoctoral Fellows

12

NSFC General Programs / Young Scientists Fund (C)

4

NSFC Joint Funds / Key Supported Fund Programs

2

National Key Research and Development Programs



**Exchanges and
Collaborations**

9

Conferences,
Meetings and Trainings

179

Conference
Talks

16

Newly Appointed
in Journals

22

Newly Appointed
in Organizations or
Associations

18

Visiting Scholars

38.7%

International Joint
Publications

361

Papers
Published

32

Patents

12

Software
Copyrights



Cruises

51

Cruises

461

People

1086

Days at Sea



**New
Members**

2

Faculty

5

Research
Scientists

3

Outstanding
Postdoctoral
Fellows

9

Research
Assistants

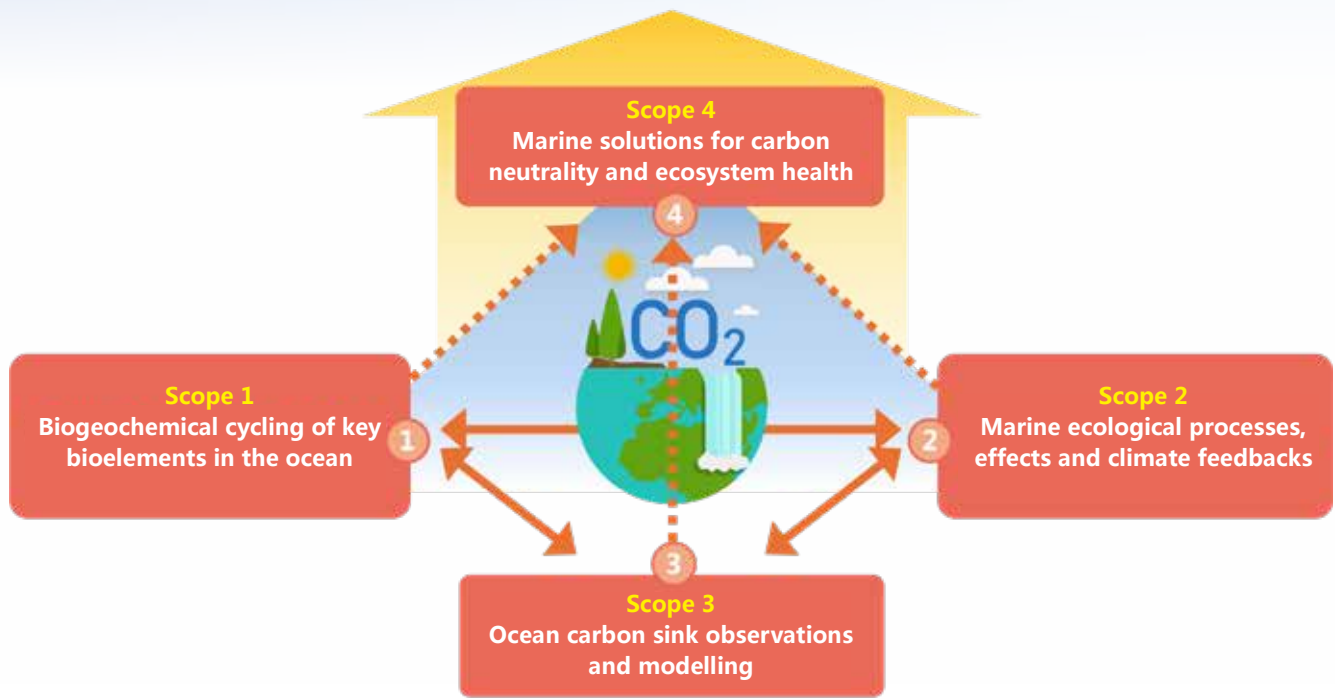
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Admin
Staff

Our Course in the Deep Blue



MEL's Research Focuses



Biogeochemical cycling of key bioelements in the ocean

- Investigate the marine biogeochemical cycles of essential biogenic elements, including carbon, nitrogen, and iron
- Examine the fluxes of these elements across land-sea-air interfaces across varying spatial and temporal scales
- Explore the cycling of macro- and micro-nutrients, focusing on the physical, biological, and chemical mechanisms that regulate these processes

Ocean carbon sink observations and modelling

- Utilize multi-dimensional intelligent observation techniques to study typical local and regional systems
- Conduct comprehensive research in marine environmental observation, reconstruction, simulation, and forecasting using integrated and advanced observational methods

Marine ecological processes, effects and climate feedbacks

- Study the structure and functions of marine ecosystems
- Investigate the processes, impacts, and climate feedback mechanisms of key biological groups, focusing on their roles in biogenic element cycling, oceanic carbon sequestration, and related ecological processes

Marine solutions for carbon neutrality and ecosystem health

- Investigate the role of marine ecosystems in mitigating climate change
- Develop innovative strategies to enhance oceanic carbon sinks, advance research on marine health and sustainable development, and optimize approaches that integrate carbon sequestration, biodiversity conservation, and ecological health

Academic Committee

January 2025 witnessed MEL's restructuring and the establishment of its new academic committee, chaired by Prof. Lixin WU. The first meeting of the newly formed committee was convened in January as well.



Honorary Director



Prof. Dunxin HU
Institute of Oceanology, CAS

Director



Prof. Lixin WU
Ocean University of China / Laoshan Laboratory

Associate Director



Prof. Zhengtang GUO
Institute of Geology and
Geophysics, CAS

Associate Director



Prof. Minhan DAI
Xiamen University

Committee Members



Prof. Bojie FU
Research Center for Eco-
Environmental Science, CAS



Prof. Dabo GUAN
Tsinghua University



Prof. Zhimin JIAN
Tongji University



Prof. Nianzhi JIAO
Xiamen University



Prof. Jiabiao LI
Second Institute of Oceanography,
MNR



Prof. Shuying LENG
Institute of Geology and
Geophysics, CAS



Prof. Kenneth LEUNG
City University of Hong Kong



Prof. Xiaopei LIN
Ocean University of China



Prof. Lianqing LIU
Shenyang Institute of Automation,
CAS



Prof. Fan WANG
Institute of Oceanography,
CAS



Prof. Yigang XU
South China Sea Institute of
Oceanology, CAS



Prof. Si ZHANG
Southern Marine Science
and Engineering Guangdong
Laboratory (Guang Zhou)



Prof. Meixun ZHAO
Laoshan Laboratory



Prof. Tong ZHU
Peking University

A group of students wearing white hard hats and pink shirts are on the deck of a ship. They are working with a large, white, conical net that is suspended by ropes. The net is being lowered into the deep blue ocean. The students are holding onto the ropes and a yellow hose. In the background, there is a blue crane and some orange equipment on the deck. The sky is clear and blue.

Our Course in the Deep Blue

"Evolution and Tipping Dynamics of Complex Coastal Zone Systems," a Major Research Plan of NSFC was launched

Coastal zones are comprised tightly coupled physical, ecological and social subsystems. Since the Industrial Revolution, human interventions have reshaped shoreline morphology and land-sea interactions, altering the transport and fate of key biogeochemical elements (C, N, P). Climate change amplifies these impacts, raising the risk of coastal systems approaching—or crossing—critical thresholds. This project targets the dynamics of tipping processes in four representative regions of China: the Bohai Rim, the Yangtze River Delta, the Guangdong-Hong Kong-Macao Greater Bay Area, and the Western Coast of the Taiwan Strait. We will fuse multi-source data, develop high-resolution regional Earth system models, and build coastal digital twins to detect early warning signals, quantify thresholds, project multi-scale futures, and optimize development pathways that balance ecological security with socio-economic benefits.

The program is led by the NSFC Steering Expert Group. Its program office is hosted by MEL, Xiamen University.



Marine biogeochemistry and global change

NSFC Young Scientists Fund (A) 2025-2029 | Dalin SHI



This project focuses on nutrient regulation, its underlying mechanisms, and evolutionary trends of marine phytoplankton and primary productivity. It aims to identify key phytoplankton groups governing primary production and their nutrient limitation types, clarify the adaptation mechanisms of key groups to nutrient limitation, and reveal how nutrients regulate the response of key groups to global change. The outcomes are expected to advance the field of marine biogeochemistry and strengthen China's international leadership and competitiveness in global change research.

Marine biogeochemistry

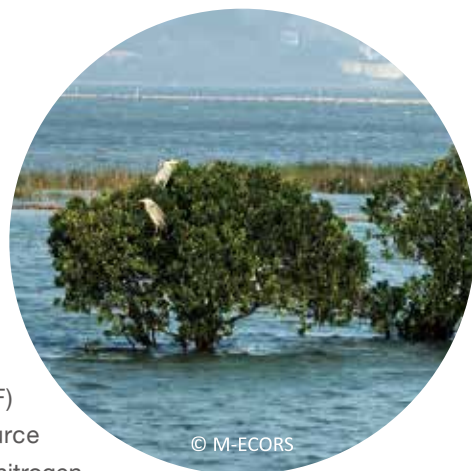
NSFC Young Scientists Fund (A) 2026-2030 | Zhimian CAO

This project investigates the role of the trace element iron in the marine biological pump and carbon sink. It first examines the spatiotemporal distribution of iron isotopes and their underlying controls, clarifying their coupling with carbon and nutrient cycles. Next, it establishes a quantitative calibration between iron isotope fractionation and carbon export flux, evaluating its utility as an indicator of biological pump efficiency. Finally, the project assesses the mechanistic basis, effectiveness, and environmental impacts of iron fertilization, with the goal of optimizing the implementation of ocean iron fertilization. The overarching objectives are to develop innovative stable isotopic proxies for marine applications, address key challenges in trace metal and isotope biogeochemistry, advance understanding of carbon fixation and storage mechanisms in oligotrophic seas, and support the development of marine carbon dioxide removal strategies.

Integrated regulatory mechanisms of nitrogen cycling across the river-estuary-bay continuum

NSFC Key Project 2026-2030 | Nengwang CHEN et al.

This project addresses nitrogen cycling imbalance at land-sea interfaces under global change. Using the Jiulong River Estuary as a model system, it investigates spatial patterns across discontinuities in the river-sea continuum. The work will establish nonlinear response matrices linking key nitrogen processes to environmental drivers, enabling cross-scale integration from microbial mechanisms to seaward nitrogen fluxes. A Dynamic Zonation Source Process Flux (DSPF) model will be developed to trace cascading nitrogen pathways from multisource inputs through estuarine transformation to sea air export. By clarifying synergistic nitrogen carbon mitigation and cross interface regulatory mechanisms, the project aims to provide a novel framework for integrated land sea management.



Coastal microbiology

NSFC Young Scientists Fund (B) 2026-2028 | Yue ZHENG

Coastal methane-metabolizing microorganisms serve as both climate regulators and recipients of climate change impacts. This project focuses on their functional adaptation and ecological thresholds under global change. By analyzing the feedback mechanisms between "environmental variables" and "biological processes," a spatiotemporal dynamic feedback model will be developed to assess the evolutionary trends of coastal methane cycling. The study aims to provide innovative scientific foundations for the synergistic management of methane emission reduction, carbon sink enhancement, and ecosystem health.



Ecosystem evolution and strategies for marine carbon dioxide removal in ocean deserts

National Key Research and Development Program 2026-2030 |
Wei-lei WANG et al.

This project addresses the central scientific challenge of developing efficient and sustainable marine-based carbon dioxide removal (mCDR) strategies by integrating the natural evolutionary processes of ecosystems in ocean desert regions. Focusing on the North Pacific Subtropical Gyre, the research follows an integrated framework that spans ecosystem evolution, mechanisms of carbon fixation and storage, mCDR material development, and pre-deployment modeling of mCDR interventions. The project aims to achieve *in situ* measurements of deep-ocean carbon sequestration rates, elucidate full-depth ecosystem-scale carbon fixation and storage mechanisms, and clarify the coupled evolution of marine ecosystems and the carbon cycle. In parallel, it will develop environmentally friendly, novel mCDR materials and assess their carbon sequestration potential and integrated climate impacts. Finally, the project will conduct model-based pre-deployment simulations and multi-scenario risk assessments to inform the design of safe, efficient, and sustainable mCDR strategies.

Status and evolution of marine dissolved organic carbon

Support Program for Young Teachers' Scientific Research and Innovation Capabilities in Central Universities 2025-2029 | Yuan SHEN

In the context of global climate change and the "dual carbon" (carbon peaking and carbon neutrality) strategic goals, the accurate assessment of natural carbon sink potential is essential for emissions reduction and sink enhancement. As one of the largest organic carbon reservoirs in the Earth system, the marine dissolved organic carbon pool remains subject to significant uncertainties regarding its storage dynamics and regulatory mechanisms. This project proposes to elucidate the evolution of the marine DOC reservoir through molecular biomarker tracing and model simulations. These efforts aim to provide scientific support for improving the precision of ocean carbon sink assessments and optimizing pathways toward carbon neutrality.

Marine metabolism and element cycles

NSFC Innovation Research Group | 2025-2029, Dalin SHI et al.

Focusing on the spatiotemporal variation of marine plankton metabolism and its coupling with elemental cycles, this project has achieved major progress: 1) revealing the substantial contribution of diazotroph UCYN-B to global marine N_2 fixation; 2) elucidating how light enhancement promotes the release and transfer of diazotroph-derived nitrogen; 3) demonstrating the stronger carbon fixation and storage capacity of the biological pump in the North Pacific Transition Zone than in the southern region; and 4) clarifying the opposite responses of phytoplankton communities in the eastern and western tropical Pacific to ENSO and PDO.

Spatio-temporal variability of the Indonesian Seas circulation and its effect on the nutrient budget

NSFC Key Project 2024-2028 | Huijie XUE et al.

Deciphering regional hydrodynamics and biogeochemistry, and their variability, lays the foundation for understanding and protecting the biodiversity of the Indonesian Seas. Using a coupled hydrodynamics-biogeochemistry model, assisted with *in situ* and satellite observations and inverse modeling, we have made significant progress in the first two years of the project, which are detailed below: (1) completed a hindcast of the Indonesian Seas circulation for the period between 1991 and 2022, illustrated the coherence and discordance among the major basins of the Indonesian Seas, and identified the local and remote forcing factors in regulating multi-scale variability in the Indonesian Seas. Additionally, results from

machine learning models and Observing System Simulation Experiments demonstrated the importance of observations from the Maluku Channel in determining the variability across the Indonesian Seas; (2) quantified the contribution of various physical and biogeochemical processes to the cycling of nitrate, phosphate, and silicate in the Indonesian Seas and estimated nutrient fluxes through the principal straits in the Indonesian Seas; and (3) collaborating with Indonesian colleagues, installed aerosol collection apparatus at two sites and compiled *in situ* measurements during the 2018 and 2023 cruises to the Indonesian Seas.

Mechanisms and prediction of decadal climate change based on energy processes

Young Scientist Project of National Key Research and Development Program 2023-2028 | Kewei LYU et al.

From the perspective of energy processes through the climate system, this project intends to deepen the understanding of decadal climate change and develop a new approach for decadal climate prediction. This project has yielded the following key advances: (1) quantified decadal changes in heat storage of the ocean, atmosphere, land and cryosphere, along with the magnitudes and sources of associated uncertainties; (2) diagnosed the dynamic mechanisms underlying the tropical Pacific decadal variability and clarified the contribution of Atlantic trans-basin teleconnections; (3) identified sources of decadal predictability for East Asian summer monsoon precipitation and Eurasian surface temperature through the integration of artificial intelligence and climate dynamics, effectively improving prediction skill.

Microbial oceanography

NSFC Fund for Distinguished Young Scholars 2022-2026 | Yao ZHANG

This project elucidated microbial-driven coupling of multiple elements and material-energy transformations across ocean layers, and their responses and evolutionary mechanisms to dynamic processes. This project achieved an excellent mid-term evaluation.



© Yaqi YUAN

NSFC Open Research Cruise in the central South China Sea (NORC2025-06)

In early November 2025, the NSFC Open Research Cruise (NORC2025-06) was successfully completed aboard the RV *TKK* in the central South China Sea. The expedition was comprised of three specialized legs: geological and geophysical surveying, Haidou-1 ARV scientific operations, and comprehensive biogeochemical research. Led by Chief Scientists Assoc. Prof. Hongmei CHEN and Tiantian TANG of Xiamen University, the cruise supported 32 NSFC-funded projects involving 81 researchers from 20 Chinese institutions. A total of 56 stations were sampled, with operations including CTD casts, multiple-net plankton sampling, trace metal sampling, large-volume *in situ* filtration, sediment box coring, gravity coring, and deployments of the Haidou-1 autonomous remotely operated vehicle.



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Research Cruise of the National Key Research and Development Program of China “PIN-Pump” (2023YFF0805000)

From May to July, the research cruise of the National Key Research and Development Program of China “PIN-Pump” (Grant No. 2023YFF0805000) research cruise was successfully carried out in the western North Pacific aboard the RV *TKK*. Prof. Dalin SHI served as the Project Leader, and Zuozhu WEN as the Chief Scientist of the cruise. A total of 36 scientists and researchers from four Chinese institutions participated in the expedition. During the 58-day voyage, 322 over-the-side operations were conducted, including CTD casts, tow-fish underway sampling, multiple-net plankton sampling, *in situ* large-volume pumping, gravity coring, box coring, turbulence observations, floating and mooring sediment trap deployments, and aerosol sampling.



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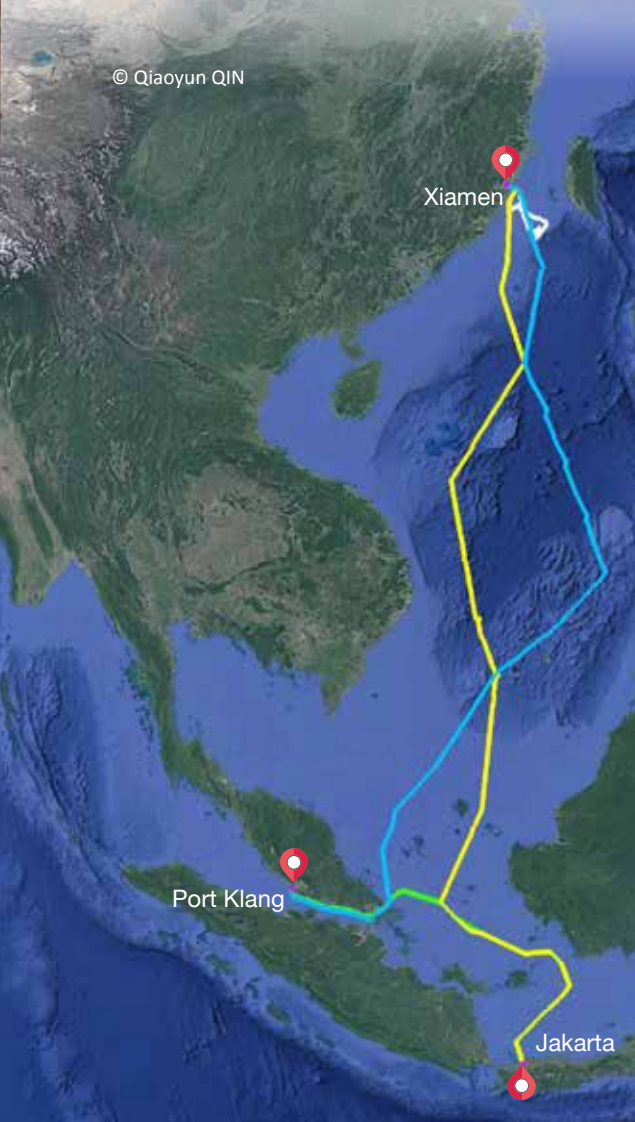


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2025 “XMU@Sea” Undergraduate Training Cruise

From July to September 2025, the “XMU@Sea” Undergraduate Training Cruise (XMU@SEA) aboard the RV *TKK* completed four legs under the leadership of Chief Scientists Assoc. Prof. Xiaolin BAI, Assoc. Prof. Kuanbo ZHOU and Prof. Xianhui WAN (all from Xiamen University), and Dr. Iskandar Budhi Hascaryo (IPB University). The cruise brought together students from domestic and international universities for hands-on marine research, including CTD casts, plankton trawls, and nutrient analysis. The third leg strengthened international collaboration with Indonesian participants, while a port call in Indonesia featured an open vessel event promoting scientific exchange and the spirit of Tan Kah Kee. The cruise also crossed the equator twice, marking a milestone for the RV *TKK*.

Significant contribution of the unicellular cyanobacterium UCYN-B to oceanic nitrogen fixation

Based on high-resolution observations in the North Pacific Subtropical Gyre, this study reveals that regional N_2 fixation is dominated by the unicellular cyanobacterium UCYN-B. Using the Generalized Additive Model, we predicted the global oceanic distribution of UCYN-B and, for the first time, systematically assessed that dominant oceans of UCYN-B can contribute a N_2 fixation flux of 10.8–15.0 Tg N yr⁻¹. The study highlights the significant contribution of UCYN-B to marine N_2 fixation and provides a new perspective for understanding the evolution of ocean carbon and nitrogen cycles under climate change.

Reference:

Jiang, RT#; Hong, HZ#; Wen, ZZ; Yu, XR; Browning, TJ; Chen, Z; Shang, YP; Liu, X; Cao, ZM; Achterberg, EP; Dai, MH; Shi, DL* (2025). Significant contribution of the unicellular cyanobacterium UCYN-B to oceanic nitrogen fixation. *NATIONAL SCIENCE REVIEW*, 12(10), nwaf337.

The overlooked contribution of the seasonal mixed layer pump to carbon export in low-latitude oceans

The seasonal mixed layer pump (MLP) is a crucial pathway for organic carbon transport from the upper to deep ocean, yet its role in low-latitude oceans is often overlooked. Using 26 biogeochemical Argo floats, this study quantified MLP-driven carbon export between 35°N and 35°S, revealing that contributions in some low-latitude regions are comparable to those at high latitudes. The MLP intensity is controlled by the relative positions of mixed layer depth, euphotic zone depth, and nitracline depth. Global low-latitude MLP carbon export totals 0.07 ± 0.02 Pg C yr⁻¹, 75% higher than previous estimates. This study elucidates the previously underestimated importance of the seasonal MLP in oligotrophic oceans where carbon export pathways are limited.

Reference:

Xu, C; Cassar, N; Thompson, AF; Zhang, YC; Wang, HL; Liu, X*; Huang, BQ* (2025). The overlooked contribution of the seasonal mixed layer pump to carbon export in low-latitude oceans. *NATURE COMMUNICATIONS*, 16(1), 10681.

Removal of dissolved arsenic from deep seawater around hydrothermal vents and seamounts

Oceanic cycling of arsenic (As) is closely linked to that of nutrient and trace metal elements such as phosphorus (P) and iron (Fe) due to similar particle-reactivity of As and P and their association with particulate carriers including Fe (oxyhydr)oxides. However, this particle scavenging effect is rarely reflected in seawater depth profiles of total dissolved inorganic As (DAs), which typically resemble those of nutrients, generally showing increasing concentrations with depth.

By using a highly sensitive, custom-made hydrogen generation-atomic fluorescence spectrometer, we obtained high-resolution DAs data from the subtropical western North Pacific. Combined with dissolved and total dissolvable particulate distributions of trace metals (Fe and manganese) and model simulations, we observed distinct removal of DAs from deep waters in specific deep-sea regions mediated

by independent deep-sea systems, including hydrothermal vents, seamounts, and island sediments. Our findings highlight a previously overlooked sink term for DAs removal from seawater by particles of various deep-sea origins. Newly estimated output fluxes around hydrothermal or seamount systems are comparable to the individual input flux from rivers, atmosphere, and hydrothermal vents, thus helping to balance the global oceanic As budget.

Reference:

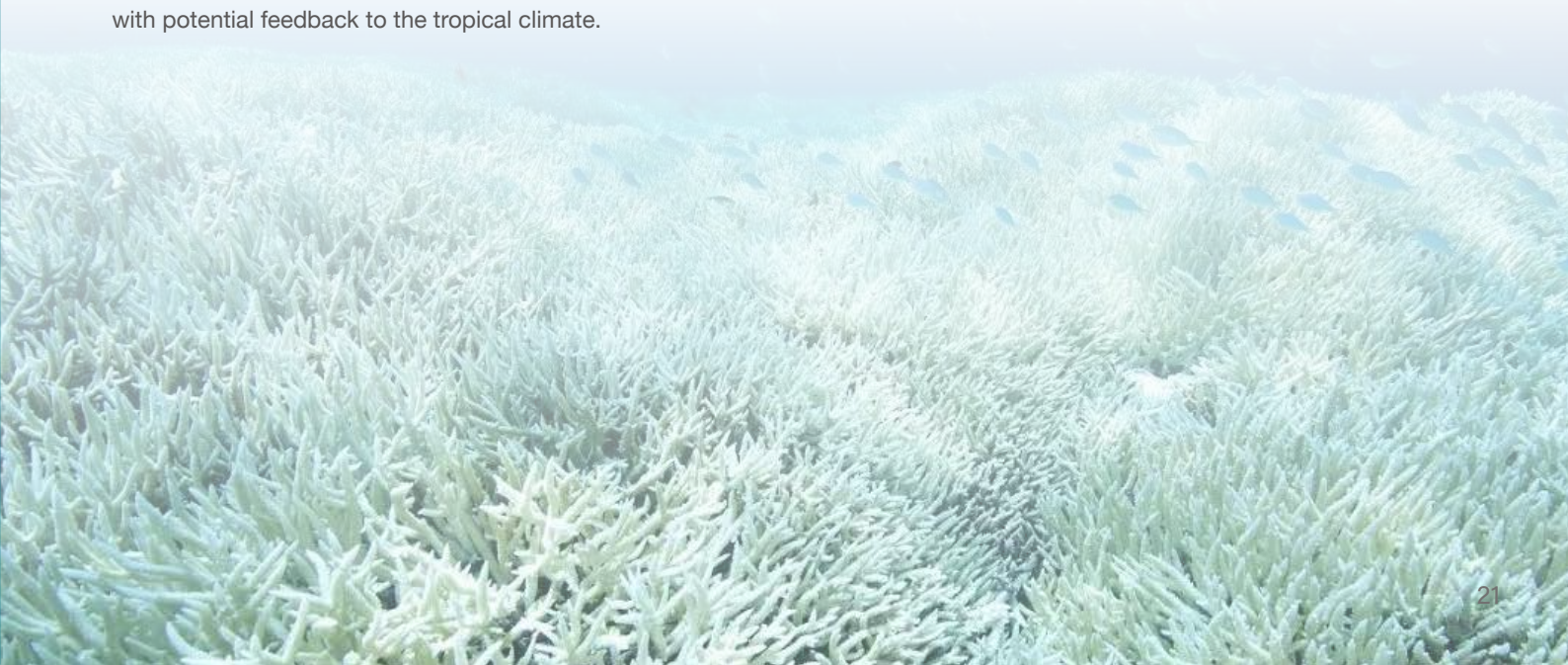
Li, YC; Bo, GY; Cai, YH; Zhang, K; Zhou, KB; Zhang, PP; Yang, CJ; Chen, TY; Dai, MH; Ma, J*; Cao, ZM* (2025). Removal of dissolved arsenic from deep seawater around hydrothermal vents and seamounts. *EARTH AND PLANETARY SCIENCE LETTERS*, 660, 119351.

Ocean's largest chlorophyll-rich tongue is extending westward (2002-2022)

An expansive, westward-stretching chlorophyll-rich tongue (CRT) in the Equatorial Pacific supports 18% of the annual global new production. We demonstrate that the CRT exhibits an ongoing westward extension during 2002-2022, driven by intensified currents, as the Pacific Decadal Oscillation predominantly remains in its negative phase. Our findings imply a broader cover of productive water along the equator, with potential feedback to the tropical climate.

Reference:

Peng, SX; Yu, XL; Lee, ZP; Lin, HY; Liu, X; Dai, MH; Shang, SL* (2025). Ocean's largest chlorophyll-rich tongue is extending westward (2002-2022). *NATURE COMMUNICATIONS*, 16(1), 103.



Contrasting climate oscillations impacts on phytoplankton in the western and eastern tropical Pacific

Phytoplankton in the tropical Pacific are highly sensitive to climate change. Traditionally, warm ENSO and PDO phases enhance stratification, suppress nutrient supply, and reduce biomass. Integrating observations, satellite data, reanalysis, and Earth system models reveals a contrasting pattern in the western tropical Pacific. Chlorophyll and diatom concentrations increase during El Niño, with PDO amplifying this contrast, highlighting multiscale physical–biological coupling.

Reference:

An, LN; Laws, EA; Liu, X*; Chen, RY; Wang, SL; Hu, SJ; Zhang, YC; Huang, YB; Xu, FP; Chai, F; Huang, BQ (2025). Contrasting climate oscillations impacts on phytoplankton in the western and eastern tropical Pacific. *NATURE COMMUNICATIONS*, 16(1), 10931.

Eukaryotic phytoplankton drive a decrease in primary production in response to elevated CO₂ in the tropical and subtropical oceans

Based on 48 onboard acidification incubation experiments conducted in the (sub)tropical western North Pacific from 2016 to 2022, this study found that ocean acidification suppresses phytoplankton community productivity, and this effect is primarily driven by small (<20 μm) eukaryotic phytoplankton. The study further clarified that increased nitrogen supply can alleviate the inhibitory effect of acidification. These results provide important evidence for accurately predicting the evolution of the ocean carbon cycle under global change.

Reference:

Dai, RB#; Wen, ZZ#; Hong, HZ#; Browning, TJ; Hu, XH; Chen, Z; Liu, X; Dai, MH; Morel, FMM*; Shi, DL* (2025). Eukaryotic phytoplankton drive a decrease in primary production in response to elevated CO₂ in the tropical and subtropical oceans. *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*, 122(11), e2423680122.



Special delivery of proteinaceous matter to deep-sea microbes

Deep-sea dissolved organic carbon (DOC) has long been regarded as a highly refractory carbon reservoir with extremely slow turnover. Using radiocarbon analyses and microbial incubation experiments, this study demonstrates that the deep-sea DOC pool contains previously hidden, young, protein-like organic matter that can be rapidly utilized by microbes. Moreover, the results reveal that diel vertical migration of zooplankton actively and efficiently delivers labile organic matter to the deep ocean, functioning as an “energy express” for deep-sea microbes. These findings challenge the conventional view of an inert deep-sea DOC reservoir and highlight the pivotal role of zooplankton in deep-ocean carbon cycling and microbial metabolism.

Reference:

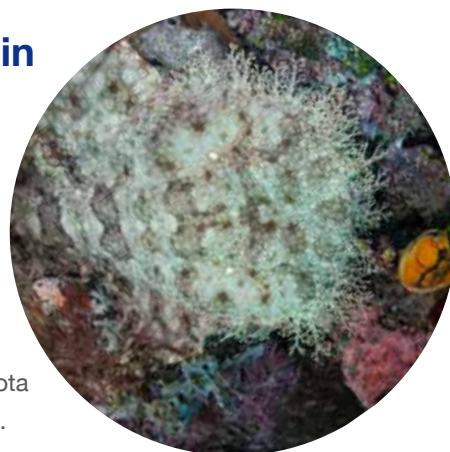
Shen, Y*; Benner, R*; Broek, TAB; Walker, BD; McCarthy, MD (2025). Special delivery of proteinaceous matter to deep-sea microbes. *SCIENCE ADVANCES*, 11(12), eadr0736.

Important role of Marine Group II Euryarchaeota in organic carbon cycling in the South China Sea

Marine Group II Euryarchaeota are heterotrophic archaea widespread from coastal to open oceans. Multi-omics revealed three ecotypes, whose distinct metabolisms drive marine organic carbon from labile to refractory forms, highlighting their key role in marine carbon cycling and sequestration.

Reference:

Lu, Y#; Li, Q#; Zhao, D; Zhang, Y* (2025). Important role of Marine Group II Euryarchaeota in organic carbon cycling in the South China Sea. *SCIENCE BULLETIN*, 70(5): 597-599.



Decadal variability in the core strength of the South Pacific Convergence Zone

Previous studies have primarily focused on the positional shifts of the SPCZ, whereas this work investigates the decadal variability in its core strength. By separating internal variability from external forcing, we found that changes in core strength are predominantly driven by local SST internal variability. Its influence significantly surpasses the remote teleconnection effects of climate modes such as ENSO and IPO, as well as the impact of external forcing. This provides new insights for regional climate prediction.

Reference:

Wang, HD; Zhuang, W*; Yan, XH (2025). Decadal Variability in the Core Strength of the South Pacific Convergence Zone. *GEOPHYSICAL RESEARCH LETTERS*, 52(16), e2025GL116182.

Occupational carbon footprints and exposure to climate transition risks

As the low-carbon transition accelerates, workers in high-carbon occupations face significant climate transition risks. Existing research lacks systematic assessment of occupational carbon footprints and associated risks. This study develops a risk assessment framework to systematically reveal the global distribution patterns of occupational carbon footprints and disparities in risk exposure and protection measures, thereby providing a scientific reference for achieving a just transition in the labor market.

Reference:

Zhang, ZK; Zheng, CZ; Xiao, ZY; Zhu, KF* (2025). Occupational Carbon footprints and exposure to climate transition risks. *NATURE COMMUNICATIONS*, 16(1), 5886.

Coastal restoration may not necessarily enhance blue carbon sink

Large-scale restorations involve replacing *Spartina alterniflora* with mangroves, yet the full effects of such saltmarsh-mudflat-mangrove land-use change on the blue carbon sink are largely unknown. This study reveals that such restoration efforts through excavation and burial of *S. alterniflora* inadvertently cause pulse methane emission and a significant climate debt, potentially taking over three decades to offset. These findings highlight the potential risk of methane emission from coastal restoration in neutralizing blue carbon sink.

Reference:

Zhu, XD*; Qin, ZC; Liu, WW; Kirwan, ML; Lu, HL; Lee, SY; Dai, MH* (2025). Coastal restoration may not necessarily enhance blue carbon sink. *GEOPHYSICAL RESEARCH LETTERS*, 52(11), e2025GL114614.



Unstable supply and future shortages of wild forage fish heighten risks to global fed aquaculture production

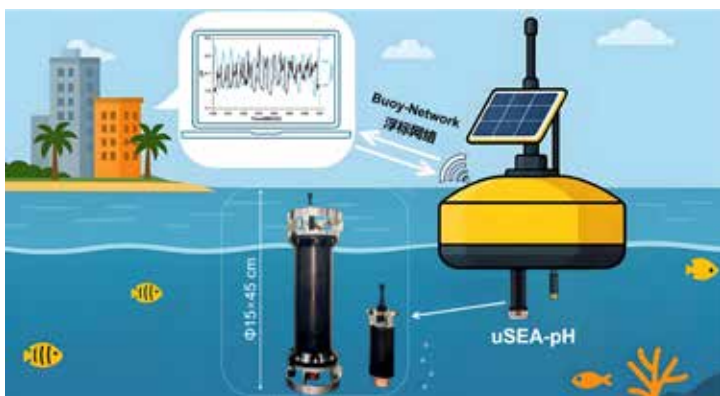
Over half of global aquatic animal production relies on external feed, with key ingredients like fishmeal and fish oil derived from wild-caught “forage fish.” While existing research has focused on over exploitation driven by aquaculture expansion, systematic assessments of how multiple external pressures disrupt forage fish supply and affect fed aquaculture remain lacking. This study evaluates global forage fish stocks and develops a shortage model to quantify, for the first time, the vulnerability of the feed supply chain at a global scale. Findings indicate that under combined pressures, future forage fish supply could decline substantially, leading to yield reductions of up to 35% for high-value species such as salmon and eel. Maintaining current production levels would require an additional 1.8 million tonnes of alternative ingredients annually. This research provides critical scientific support for advancing feed diversification and developing novel proteins to enhance the resilience of the aquaculture sector.



Reference:

Liu, Y; Jiang, ZY; Cottrell, RS; Tlusty, MF; Fitzsimmons, K; Cao, L* (2025). Unstable supply and future shortages of wild forage fish heighten risks to global fed aquaculture production. *NATURE FOOD*, 6(10): 1068-1078.

An autonomous pH sensor for real-time high-frequency monitoring of ocean acidification in Estuarine and Coastal Areas



Dual-configuration design of uSEA-pH and its application in real-time coastal buoy monitoring

In situ pH sensing is crucial for real-time ocean acidification monitoring and carbon cycle research. This study developed the uSEA-pH sensor based on ISFET, featuring rapid response, high precision, supporting high-frequency sampling, and multi-platform compatibility. Through high-frequency underway monitoring and *in situ* deployments, uSEA-pH successfully detected subtle pH variations, generating over 2.3 million field measurements. This study presents a viable, robust, and high-resolution approach for continuous pH monitoring in estuarine and coastal areas.

Reference:

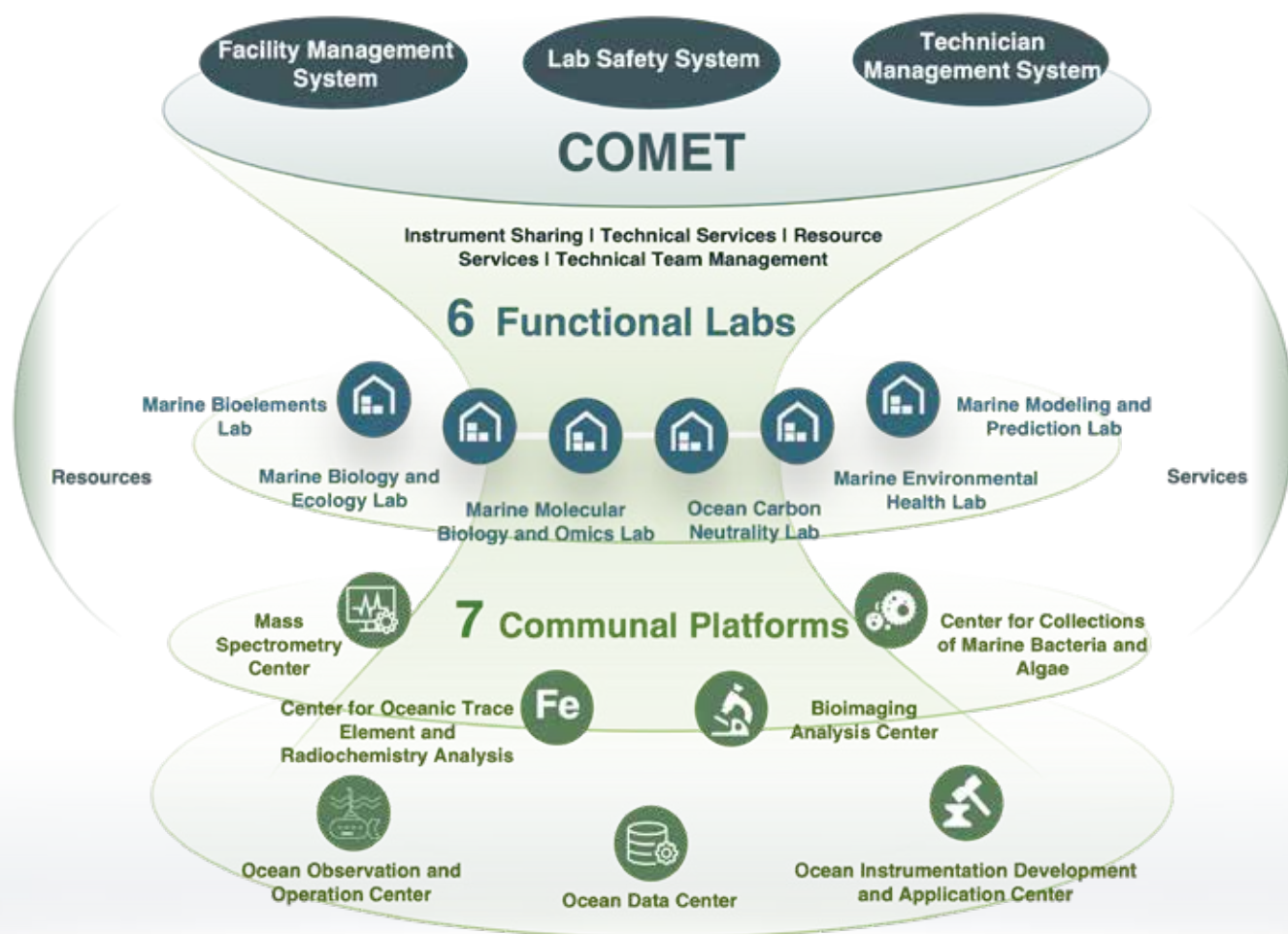
Zheng, SL#; Yang, F#; Huang, SK; Li, HQ; Chen, ZY; Zhu, M; Yao, HM; Li, JP; Ma, J* (2025). An Autonomous pH Sensor for Real-Time High-Frequency Monitoring of Ocean Acidification in Estuarine and Coastal Areas. *ANALYTICAL CHEMISTRY*, 97(49): 27113-27121.

MEL Facilities



Center of Major Equipment and Technology (COMET)

COMET, established in 2008, is dedicated to the integrated management of laboratory safety, instrumentation, and technical staff training and assessment. It has successfully implemented an online booking system for major equipment, ensuring open and transparent access. In 2025, MEL restructured the COMET platform, focusing on the development of six functional laboratories and seven core facilities.



Ocean Observation Technology and Survey Center

The Ocean Observation Technology and Survey Center is one of the central platforms established under COMET. It focuses on the development and application of marine *in situ* survey and observation technologies. In aspects such as observation and monitoring, technical equipment, and survey data, it provides professional technical support for fields including scientific research, marine engineering, environmental ecology, the regional economy, and national defense security. Moreover, it offers high-quality open services to the vast COMET user community in aspects such as marine observation design and implementation, equipment support and service, quality control and analysis of survey data, and research and development and promotion of observation instruments.



51

Observation Instruments

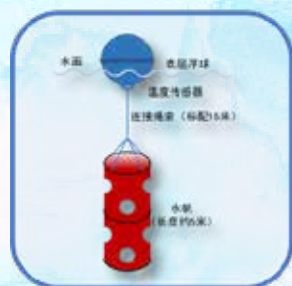


100+

Survey Cruises

5,000+

Survey Stations



4

Instruments Developed

100+

Instrument Applications

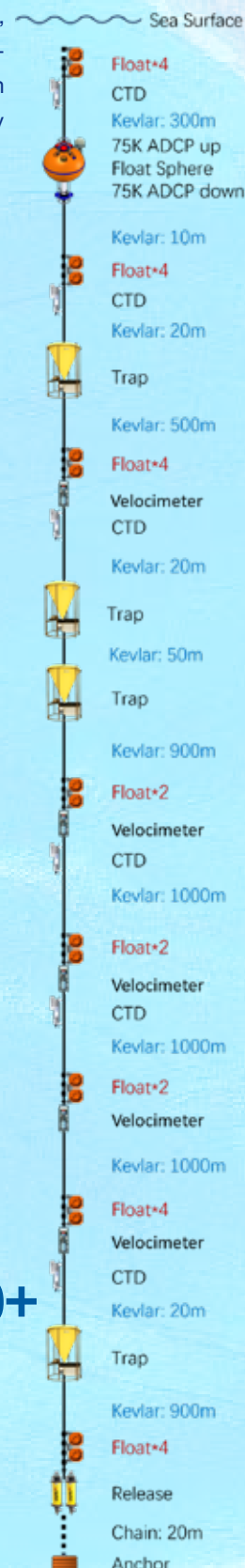
Data QC and Compilation

Stations 10,000+

Cruise distance 100,000+

5,940 m

Maximum Depth Surveyed





The operation was conducted under the Program "Regulation and Evolution Trends of Nitrogen, Phosphorus, and Iron in the Biological Carbon Pump of the Northwest Pacific (PIN-Pump)," jointly implemented by the COMET Ocean Instrumentation Development and Application Center (Ocean-IDEA), Ocean Observation Technology and Survey Center teams, project members, and the RV *TKK* crew.

Successful Recovery of the time series Sediment Trap Mooring in the Northwest Pacific

Highlight

On June 21, the scientific team aboard the KK2504 cruise successfully completed a complex nine-hour recovery operation, retrieving a time-series sediment trap mooring system at 47.50° N, 165°E. The system collected a total of 61 samples over nearly one year (August 2024–June 2025) across 500 m, 1,000 m, and 5,000 m depth profiles.

As a globally significant carbon sink, the Northwest Pacific plays a crucial role in regulating the marine climate system. Through the successful recovery of this time-series sediment trap, the expedition obtained nearly one year of sinking particulate matter flux data. These data enabled quantitative analysis of organic carbon production-export-recycling efficiency, facilitating the assessment of the contribution of the biological pump in the Northwest Pacific to both regional and global carbon cycles. The recovery provides a solid theoretical foundation for addressing climate change and formulating ocean-based carbon sequestration strategies, marking a breakthrough in long-term deep-sea observations.



© Kan ZHANG



© Ziyu WU

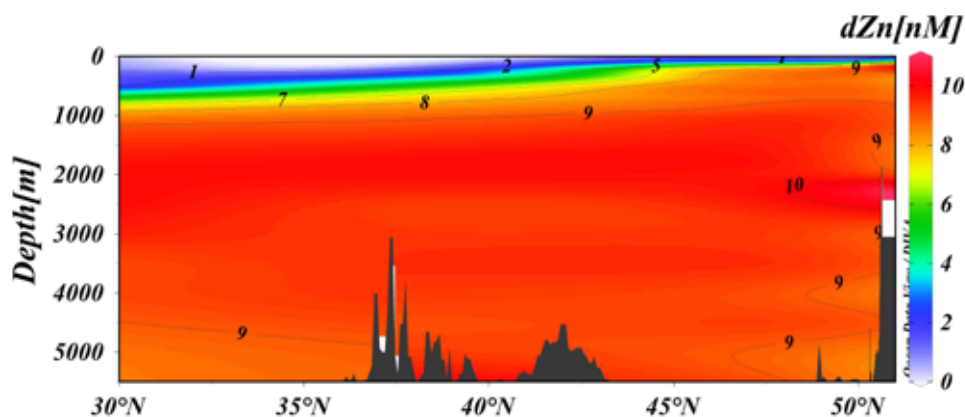


Development of a Shipboard Analyzer for Trace Zinc Determination

A shipboard analyzer for determining trace levels of zinc in seawater was developed using p-Tosyl-8-aminoquinoline (pTAQ) as a fluorescent reagent, combined with flow injection and chelation resin-based solid-phase extraction techniques (Flow Injection–Solid Phase Extraction–Fluorometry, FI–SPE–FL).

The analyzer was deployed during the summer cruise in the Northwest Pacific. The results revealed that the ship

itself was the primary source of trace zinc contamination in the surrounding seawater. To effectively eliminate ship-derived contamination, the sampling methodology of the large-volume trace element clean sampling system was refined. This improvement allowed us to obtain, for the first time, high-resolution spatial distributions of dissolved zinc concentrations in the seawater of the Northwest Pacific Ocean.



The dissolved zinc concentrations in the seawater of the Northwest Pacific Ocean



福建台湾海峡海洋生态系统
国家野外科学观测研究站
National Observation and Research Station
for the Taiwan Strait Marine Ecosystem



© D-SMART

National Observation and Research Station for the Taiwan Strait Marine Ecosystem (T-SMART)

T-SMART has conducted 11 observation cruises of the Taiwan Strait upwelling, Dongshan Bay and Zhangjiang Estuary in 2025, fulfilling long-term monitoring protocols for water, soil, atmosphere, and biology.

A comprehensive suite of field surveys was completed, including biodiversity observations of plankton, benthos, and reef-building corals, as well as specialized observations of mangroves, salt marshes, fish, birds, and benthic organisms. Automated systems continuously monitored coastal hydrology, groundwater, mangrove carbon fluxes, canopy hyperspectral data, and sediment elevation, generating approximately 3.2 GB of data.

Building on an innovative mechanism for sharing online monitoring data, the Marine Monitoring and Information Services Center expanded the "Marine Cloud" platform in 2025. This enhanced platform now delivers stronger data and technical support for advanced research and policy-making.

MEL Synergy

© Jingwen SHI



© MEL

A Platform for Exchange

MEL fosters a dynamic, open ecosystem for collaboration, through its Visiting Fellowship Program, "111" Collaborative Program, and platforms like the Lingfeng Forum and Luncheon Seminars.

129

Visiting Scholars

360

Domestic and
International trips

7

Lingfeng Forums

19

Luncheon Seminars

21

Topical Seminars



© Shengyao SUN

A delegation of MEL visited Swire Institute of Marine Science, The University of Hong Kong

◎ UN 2025 Ocean Conference

June 9–13 Nice, France

MEL's delegation hosted a series of side events at the UN 2025 Ocean Conference. Global-ONCE jointly released the *One Ocean Science Conference (OOSC) Manifesto* together with UNOC organizers. Other groups of delegates also released the report for building strong policy foundations for ocean accounting and blue finance, and launched a Call for Action to shape the global ocean agenda beyond 2030, establishing a platform for global dialogue and cooperation.

Discussions also focused on key scientific frontiers, including integrated ocean carbon research and extending the Planetary Boundaries framework to encompass the ocean's interior. These efforts deliver crucial scientific insights and solutions for improving Earth system management and addressing climate change.



© Yan YANG



© Fujian-OI



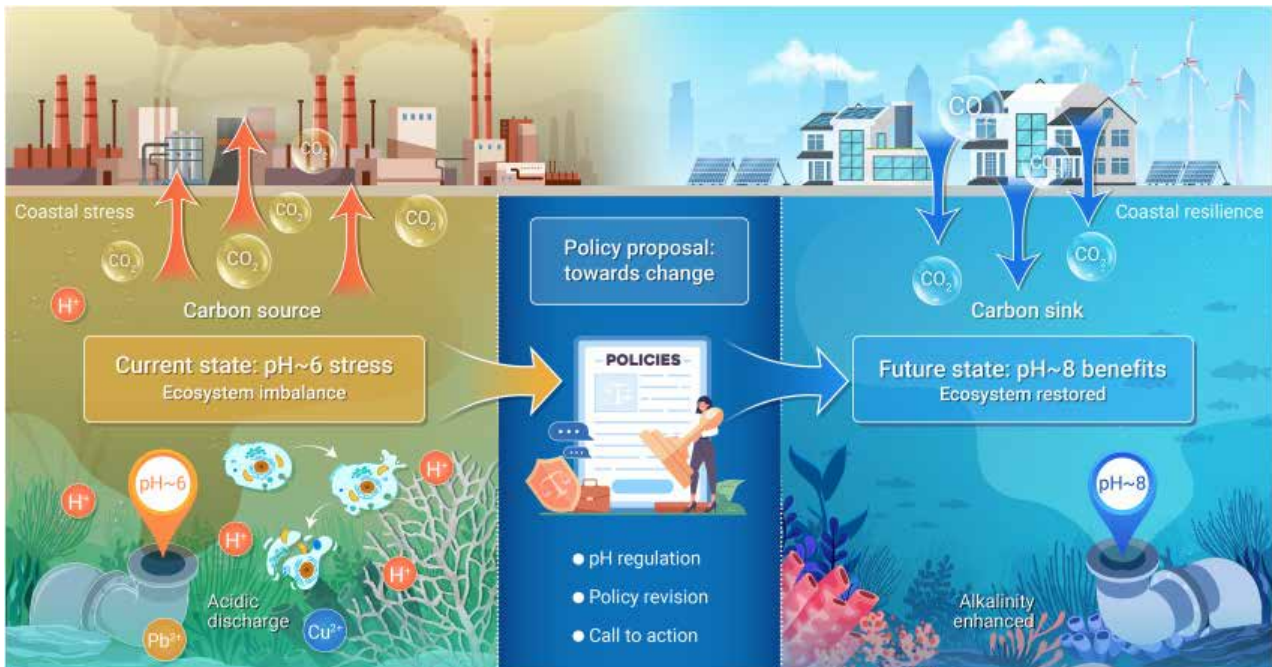
© **Xiamen Symposium on Marine Environmental Sciences**
January 14–17, Xiamen, China

XMAS VII gathered over 1,700 participants from more than 36 countries and regions, featuring 58 technical sessions, 7 keynote speeches, 786 oral presentations, 761 posters, 8 workshops, 2 public forums, and 7 special events. Sessions addressed critical frontiers in marine science, thereby contributing to sustainable development.



© Global Ocean Negative Carbon Emissions (Global-ONCE) Programme

The Global Ocean Negative Carbon Emissions (Global-ONCE) Program, led by Nianzhi JIAO, Academician of the Chinese Academy of Sciences and Professor at Xiamen University, addresses the needs of global climate governance and carbon neutrality. It has been incorporated into the IPCC Special Report. Currently, the program involves 104 research institutions from 35 countries, with sub-hubs set up in Asia, Europe, and America.



ONCE also actively participated on the global stage, showcasing its key research progress and achievements to international peers.



* The 10th UN Multi-Stakeholder Forum on Science, Technology and Innovation for the SDGs

ONCE Science-Policy Brief, the only science-policy document by Chinese scientists addressing climate change since the inception of the science-policy brief mechanism at the UN STI Forum.

<https://sdgs.un.org/documents/nianzhi-jiao-et-al-2025-integrating-oceanic-carbon-sequestration-strategies-high-impact>

* The 30th Conference of the Parties (COP30) to the United Nations Framework Convention on Climate Change



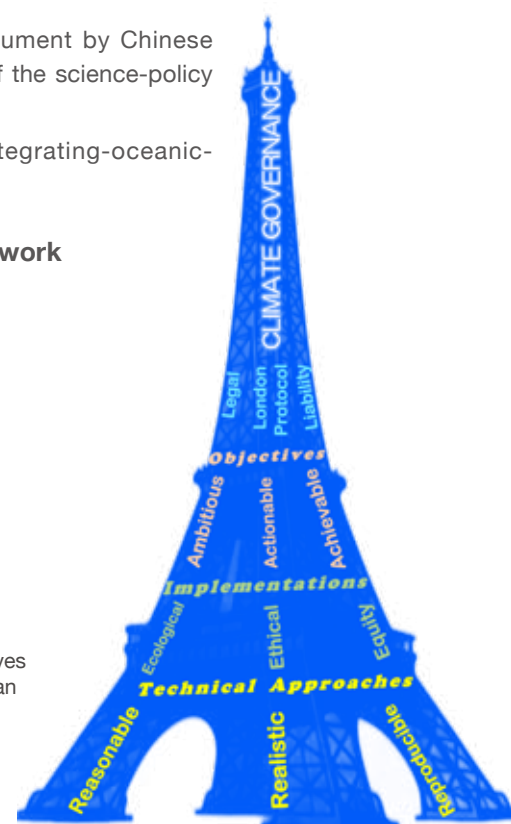
The Global-ONCE Compendium: From Science to Governance



Marine Science-Policy Interface for Transformative Governance



Technology Innovation Drives New Mechanisms for Ocean Carbon Sink Trading



© **Coastal Zones Under Intensifying Human Activities and Changing Climate: A Regional Programme Integrating Science, Management and Society to Support Ocean Sustainability (COASTAL-SOS)**

This project aims to establish new partnerships among stakeholders by jointly designing and implementing scientific research programs, promoting effective integration of science, management, and social participation through multidisciplinary, cross-field, and cross-regional collaboration, scientific innovation practices, and the effective application of their results, providing solutions for the sustainable development of coastal zones.



2021 联合国
海洋十年项目
2030 COASTAL-SOS



© Yongqi LIU

The article “Spatiotemporal Variations in Socioeconomic and Hydrological Factors Impacting Water Quality in Thailand’s Major Rivers” underscores the dominant role of local socioeconomic development in shaping the spatial pattern of water quality. These insights can thus inform strategies for sustainable water resource management.

Visiting the Oceanography Laboratory Aquatic Animal Hatchery

Visiting the Kasetsart Research Vessel



© Yongqi LIU

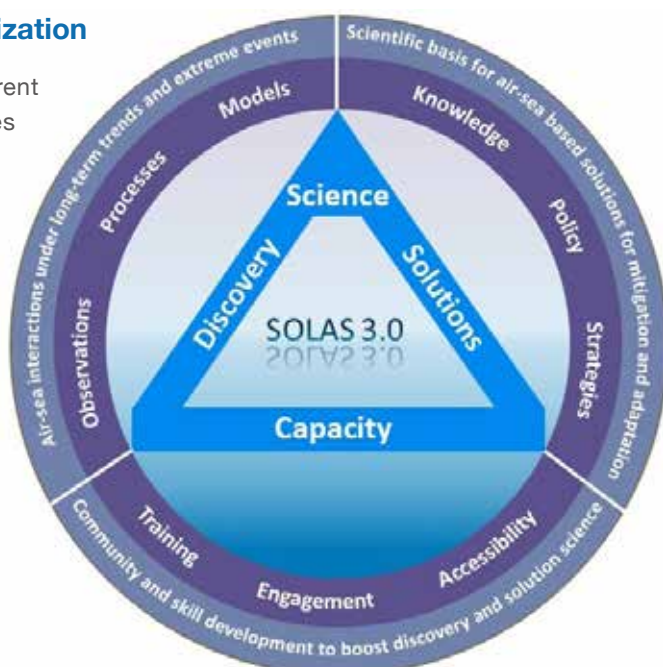
© Surface Ocean-Lower Atmosphere Study, SOLAS

Formally launched in 2004, it aims to achieve quantitative understanding of the key biogeochemical-physical interactions and feedbacks between the ocean and atmosphere, and of how this coupled system affects and is affected by climate and global change. The SOLAS International Project Office (IPO) has been hosted by MEL since 2021. In 2025, the IPO continued providing support to the SOLAS global community, including 34 National/Regional Networks, 12 Sponsored/Affiliated/Endorsed Projects and 4 Integrated Atmosphere-Ocean Time Series Stations.



SOLAS 3.0: 2026-2035 Science Plan and Organization

For its third decade, SOLAS will transition from the current research framework to a new paradigm that harmonizes “discovery science” with “science towards solutions” and “community and skill development.”



Graphical representation of the linked components of the SOLAS 3.0 science plan

SOLAS at the 46th Session of the World Climate Research Programme (WCRP) Joint Scientific Committee (JSC-46)
12-16 May in Paris, France

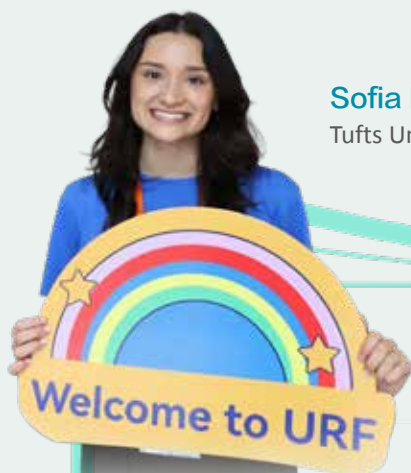




MEL Education and Public Engagement

In 2025, MEL hosted 29 international undergraduates for research training, funded 11 new doctoral candidates and postdocs, and enabled 6 researchers to pursue collaborations at world-leading institutions. From cultivating the next generation, to developing professional excellence, and finally to forging global connections, MEL strives to build a vibrant scientific community and passes the torch of discovery.

© 2025 Summer Undergraduate Research Fellowship Program in Marine Environmental Science



Sofia DELIRA
Tufts University, the USA

My research focuses on how diatoms shape the ocean's biological carbon pump under ocean warming. I truly enjoyed my time working in the lab! It was my first opportunity to learn how to use a variety of materials and equipment, which taught me so much. I'm also incredibly grateful for the friendships and connections I built through this program.

© Joint PhD and Postdoctoral Fellow Fellowships Program between SCIFAC, HKU and FEST, XMU



Yichi ZHANG
PhD Candidate
Paleontology and Marine Biology,
The University of Hong Kong

It has been an honor to be a part of the joint program between MEL and SWIMS, to integrate my personal research focus with broader marine studies from both sides. I get to think from different perspectives, experience different environments and improve my understanding of doing research. Making new friends, building new connections, and sharing knowledge are also important and valuable in this matter.

© MEL PhD Fellowship

Ruotong JIANG

PhD Candidate

Environmental Science, College of
Environment and Ecology, Xiamen
University



During my PhD, I specialized in marine nitrogen fixation and gained key expertise in marine biogeochemistry. This year, my work achieved a major milestone: we conducted the first systematic assessment of global nitrogen fixation flux of the unicellular cyanobacterium UCYN-B, revealing its significant contribution to marine nitrogen fixation. These findings were published in National Science Review. Science is as much about perseverance as it is about discovery. Moving forward, I aim to transform scientific insights into practical data models that support global sustainability.

© MEL Outstanding Postdoctoral Fellowship

Dr. Changfei HE

Xiamen University



Upon joining MEL, my research has centered on the international ONCE Program, focusing on how marine microbial metabolism influences the dissolved organic carbon (DOC) pool. By building a global marine genomic database and studying the SAR202 bacterial clade, I systematically analyzed its diversity, vertical distribution, and metabolic potential on a global scale. This work assessed its potential contribution to the marine DOC pool, providing key theoretical support for ocean negative emissions technologies.

Moving forward, I hope to identify key microbial genes and taxa involved in carbon metabolism to help quantify the marine microbial carbon sink. My goal is to advance understanding of microbe-driven carbon cycling and contribute to innovative solutions in this field.



(From the left to the right) GEOMAR, LOV and ISMAR

Renewed! MEL Marine and Environmental International Joint Training Program

In 2025, MEL renewed the "Marine and Environmental International Joint Training Program for Innovative Talents." The upgraded program expands its partnership network beyond the original collaborators—the GEOMAR Helmholtz Centre for Ocean Research Kiel in Germany and the Laboratoire d'Océanographie de Villefranche (LOV) at Sorbonne Université—by adding the Institute of Marine Sciences of the National Research Council of Italy (ISMAR-CNR). Furthermore, the categories of participants have been broadened from the original doctoral candidates, postdoctoral researchers, and visiting scholars to now include jointly supervised master's students.



Dr. Hangqian LI

2024-2025 at GEOMAR Helmholtz
Centre for Ocean Research Kiel
MEL Marine and Environmental Science
International Joint Training Program

Working with Prof. Eric Achterberg, I advanced my skills in biogeochemical sensor development, mastering 3D modeling and *in situ* instrument design to create a novel ammonium sensor. This experience abroad was both an academic and cultural journey that clarified my perspective: we are active participants in the progress of our field and the establishment of a maritime community with a shared future.

Having now completed my PhD, I have joined the Ningde Marine Center, Ministry of Natural Resources, working on environmental monitoring and research management. I encourage fellow students to seek out these global opportunities. Let contributing to our nation through science be our generation's most powerful achievement.

Summer School on Climate Change & Ocean Health

June 30–July 9 in Xiamen



MEL Summer Undergraduate Research Fellowship Program in Marine Environmental Science

July–September, Xiamen & Zhangzhou



10th MEL Graduate Academic Forum

July 9–12 in Zhangzhou



17th University Consortium on Aquatic Sciences Symposium (UCAS)

July 14–18 in Keelung & Xiamen



Public Education

The fate of our ocean in 2025 was shaped by the combined force of global frameworks and local action. MEL's efforts in public education and science communication in 2025 revolved around a core mission: to make science accessible, participation meaningful, and the future hopeful. We opened our doors internationally while connecting with local communities; we disseminated knowledge while inspiring thought; we served the present while investing in the future.



Across China, Anchored in Xiamen



Led by Prof. Minhan DAI, *18 Lectures on Ocean Culture*, the first comprehensive introductory marine science textbook in China compiled by over twenty scholars, was officially published. This textbook has already been adopted by several schools in Fujian Province such as Xiamen University, Fujian Agriculture and Forestry University and Jimei University, with plans for nationwide promotion. Based on this textbook, the inaugural "Ocean Frontiers Lecture" New Year's Eve live-stream broadcast invited the authors to deliver popular science talks and engage in dialogue with well-known science writer Shiyou YOU.

As a key component of Xiamen's International Ocean Week, the 14th Xiamen University Ocean Sciences Day set new records in both content breadth and participation scale.

60

Research groups
and more than 900
volunteers involved

83

Science
booths

89

Experiment-based
sessions

13

Science
lectures

1

Science
competition

More than 12,000 people participated in the event, including approximately 3,500 students under the age of 19. More than 1,700 young students took part in hands-on experimental sessions.



Global Vision, Local Action

On June 30, the "Au Bord de L'eau" Ocean Forum, held by MEL and the Consulate General of France in Guangzhou, brought together experts from research, industry, and policy in both countries. The discussions focused not only on cutting-edge science but also on pathways to implement the Nice Ocean Action Plan in the region.

On the same day, the Consulate General of France in Guangzhou and MEL, in partnership with nine local primary and secondary schools, jointly released the Chinese version of the educational handbook *The Ocean: Understanding and Action*. The launch was accompanied by a science exhibition, interactive handbook testing sessions, and a youth Model United Nations conference on blue carbon.



Empowering the Next Generation

The fourth edition of the Junior Blue Pioneers Training Program focused on three cutting-edge fields—new energy, digital-intelligent aquaculture, and marine sustainability—guiding 20 outstanding high-school students from China, the U.S., and Canada through a full cycle of training from scientific inquiry to hands-on investigation.

The Ocean Media Training Camp brought university students and Junior Blue Pioneers alumni to key marine-related sites in Hong Kong, such as the Swire Institute of Marine Science at HKU and the Hong Kong Maritime Museum, offering a cross-regional perspective on the complexity and diversity of ocean governance.

2025 Events

January

- ◎ Convened the 1st Academic Committee after MEL's restructuring
- ◎ Held the International Advisory Committee Meeting on MEL Strategic Planning
- ◎ Research on the “Ocean's largest chlorophyll-rich tongue is extending westward (2002-2022)” was published in *Nature Communications*
- ◎ Hosted the 2025 Xiamen Symposium on Marine Environmental Sciences (XMAS)
- ◎ Launched the first Surface Ocean-Lower Atmosphere Study (SOLAS) China Youth Scientific Committee
- ◎ Published *18 Lectures on Ocean Culture*, a comprehensive introductory textbook on marine science compiled by MEL researchers

March

- ◎ The “First Revelation of the Bidirectional Regulatory Mechanism between Earth's Life Processes and Climate Change” was selected as one of the “Top 10 Science and Technology Advances in Oceanology and Limnology” in China for 2024.
- ◎ 11 MEL scholars were listed among the “Most Cited Chinese Researchers in 2024” by Elsevier
- ◎ Conducted the NSFC Open Research Cruise in the central South China Sea aboard RV *TKK*

April

- ◎ “Marine metabolism and element cycles,” a project supported by the Innovation Research Group, National Natural Science Foundation of China (NSFC), was launched

May

- ◎ Hosted the 9th Young Scientist Ocean Dynamics Forum
- ◎ Conducted the National Key Research and Development Program of China “PIN-Pump” research cruise aboard the RV *TKK*

June

- ◎ A MEL delegation attended the 3rd UN Ocean Conference and hosted official side events. MEL held the “Au Bord de L'eau” ocean-themed event series in Xiamen
- ◎ The “Minjiang Estuary Carbon and Nitrogen Flux Intelligent Monitoring System (ECOFIMS),” independently developed by the Xiamen University Marine Monitoring and Information Service Center (MMIS), was piloted in Fujian Province
- ◎ Prof. Yigang XU delivered a lecture at the Xiamen University Qunxian Forum
- ◎ The first international standard for algae carbon footprint, “Carbon footprint for seafood - Product category rules (CFP-PCR) for macroalgae,” with deep involvement from the MEL group, was released

July

- © Hosted the Summer School on Climate Change & Ocean Health
- © The 6th XMU@Sea Undergraduate Training Cruise set sail for the South China Sea, and held an Open Day in Jakarta, Indonesia

August

- © Research on the “Significant contribution of the unicellular cyanobacterium UCYN-B to oceanic nitrogen fixation” was published in *National Science Review*
- © Held the 2025 MEL Strategic Planning Workshop at Dongshan Swire Marine Station (D-SMART)

September

- © The project "Marine Biogeochemistry and Global Change" received Category A renewal funding under the NSFC Young Scientists Program. Additionally, new projects in "Marine Biogeochemistry" and "Coastal Microbiology" were awarded Category A and Category B grants, respectively, under the same program

October

- © Congkui YE was appointed MEL's Deputy Director

November

- © Held the 14th Xiamen University Ocean Sciences Day
- © "Science and innovation driven demonstration zones to promote the implementation of Sustainable Development Goals" was accepted by the International Decade of Science for Sustainable Development, IDSSD
- © Held the 2025 Global Chinese Marine Science Symposium at Xiamen University Malaysia

December

- © Research on “Contrasting climate oscillations impacts on phytoplankton in the western and eastern tropical Pacific” was published in *Nature Communications*
- © Nianzhi JIAO received the “Fujian Provincial Science and Technology Major Contribution Award”
- © The MEL Marine and Environmental International Joint Training Program for Innovative Talents was renewed by the China Scholarship Council
- © "Evolution and Tipping Dynamics of Complex Coastal Zone Systems," a Major Research Plan of NSFC was launched.
- © Zhiyu LIU was awarded "Leading Talents in Science and Technology Innovation of Fujian Province" Program



Appendix



Awards and Recognitions

- © Research on “First Revelation of the Bidirectional Regulatory Mechanism Between Earth's Life Processes and Climate Change” won the “Top 10 Science and Technology Advances in Oceanology and Limnology” by the Chinese Society for Oceanology and Limnology, 2024

Team members: **Nianzhi JIAO**, Fengping WANG, Qichao TU, **Tingwei LUO**

- © Research on “AI-based Operational Forecasting for Coastal Harmful Algal Blooms” won the “Typical Application Scenario of Artificial Intelligence” in Fujian Province, 2025
Team members: Caiyun ZHANG, Nengwang CHEN, Shuiying HUANG, Jixin CHEN

- © Nianzhi JIAO was awarded the "Fujian Provincial Science and Technology Major Contribution Award", 2025

- © Xing JIAN was awarded the 1st Prize of the 2nd National Oceanography Teaching Competition by the Ministry of Education, China



Current Faculty Members

Xiaolin BAI	Hongyan BAO	Pinghe CAI	Yihua CAI	Ling CAO	Zhimian CAO	Fei CHAI
Bicheng CHEN	Hongmei CHEN	Luzhen CHEN	Nengwang CHEN	Minhan DAI	Hongyue DANG	Anmin DUAN
Guang GAO	Kunshan GAO	Weidong GUO	Xianghui GUO	Haizheng HONG	Bangqin HUANG	Yibin HUANG
Xing JIAN	Yuwu JIANG	Nianzhi JIAO	Feili LI	Jianghui LI	Quanlong LI	Xiaolin LI
Zhongping LI	Hongyang LIN	Xiaofeng LIN	Xin LIN	Xin LIN	Guokun LIU	Haipeng LIU
Tao LIU	Zhiyu LIU	Xin LIU	Yawei LUO	Kewei LYU	Yonglong LYU	Jian MA
Shaoling SHANG	Mingjia SHANGGUAN	Yuan SHEN	Dalin SHI	Stephan STEINKE	Qiaoguo TAN	Kai TANG
Tiantian TANG	Xianhui WAN	Bingbing WANG	Dazhi WANG	Guizhi WANG	Kejian WANG	Shanlin WANG
Weilei WANG	Xinhong WANG	Zuozhu WEN	Wupeng XIAO	Minwei XIE	Peng XIU	Dapeng XU
Huijie XUE	Jinyu YANG	Weifeng YANG	Xiaoyi YANG	Fengling YU	Xiaolong YU	Caiyun ZHANG
Kan ZHANG	Yao ZHANG	Yurui ZHANG	Zengkai ZHANG	Qiang ZHENG	Yue ZHENG	Kuanbo ZHOU
Xudong ZHU	Wei ZHUANG	Sijia ZOU				

New Members

Faculty

Dr. Xiaolong YU
Associate Professor



Dr. Xiaolong YU earned his Ph.D. from the University of Twente, The Netherlands in 2019. He conducted postdoctoral research at the University of Massachusetts Boston, USA and Xiamen University (2017-2023), and joined Xiamen University in January 2024, becoming a member of MEL in August 2025. His primary research focuses on the mechanisms and applications of ocean color remote sensing.

Dr. Kan ZHANG
Assistant Professor



Dr. Kan ZHANG earned her Ph.D. from the Institute of Geology, Chinese Academy of Geological Sciences in 2018. She conducted postdoctoral research at Xiamen University (2019-2024), and joined the university in May 2025, becoming a member of MEL in August of the same year. Her primary research focuses on marine biogeochemistry of elements and isotopes.

MEL Postdoctoral Fellowship



Zhaoxin LI

Chiba University, Japan
Quantitative Remote Sensing of
Aquatic Ecosystems



Yue LIU

Shanghai Jiao Tong University
Sustainability of the fishery system
under the context of global change



Kai YANG

University of Tasmania, Australia
Impacts of oceanic submesoscale
processes on marine ecosystems and
carbon cycling

Research Scientists



Qingquan HONG



Lei HOU



Peng JIANG



Yan WANG



Yu WANG

Research Assistant



Kaiming CAI



Yanjuan JIANG



Peng LEI



Yashi LI



Hongze LIN



Jun MAO



Shihao WANG



Gaoming XU



Yingjie YANG



Yingying YU

Admin Staff



Runhan ZHAO



Chenrui JIANG



Congkui YE



Zhijia YE

Cooperation and Exchange



Conferences and Meetings

- ◎ High Level Forum on Integrated Ocean Management and Sustainable Blue Economy for Carbon Neutrality in the Greater Bay Area. January 7 in Macao, China
- ◎ 9th Young Scientist Ocean Dynamics Forum. May 10-11 in Xiamen, China
- ◎ Side Events held during UN 2025 Ocean Conference: Ocean-based Carbon Dioxide Removal: Approaches, Risks, Co-benefits, and Governance; Blue Synergy: Co-designing a Renewable Blue Economy through Cross-sectoral Partnerships; Integrated Ocean Carbon Research: A Vision Primed for Implementation; The Ocean and Planetary Boundaries: Unlocking a Deeper Version for the Earth's Future; Sustainable Blue Economy in the Vision of Carbon Neutrality. June 9 in Nice, France
- ◎ Open Forum on CCICED 2025 Annual General Meeting - Land-Sea Coordination: Toward a Future of Harmonious Coexistence. October 16 in Beijing, China
- ◎ The 5th Offshore Carbon Capture, Utilization and Storage. October 24-26 in Qingdao, China
- ◎ China Marine Protection Alliance (ChinaMPA) Annual Conference 2025. November 5 in Xiamen, China
- ◎ 11th Symposium on Magnetotactic Bacteria Research and Applications. November 14-15 in Xiamen, China
- ◎ 2025 Global Chinese Marine Science Symposium. November 27-30 in Kuala Lumpur, Malaysia

New Partners



Renewed the MOU with the Swire Institute of Marine Science at the University of Hong Kong (SWIRE) in January



Signed an Agreement with the Research Center for Oceanography, Research Organization for Earth Sciences and Maritime, the National Research and Innovation Agency (RCO-BRIN), Indonesia in January



Signed a MOU with The University of Plymouth (UoP) in March



Signed a MOU with the Sorbonne Université (SU), France in April



Signed a MOU with the JYS Institute for Basic Science (Global – Learning & Academic research institution) for Master's · PhD students, and Postdocs (G-LAMP), Pusan National University in September



Signed a Scientific Cooperation Agreement with the Earth Systems Science and Environmental Technologies (DSSTTA), Institute of Marine Sciences (ISMAR) of the National Research Council of Italy (CNR) in November



MEL-PNU (G-LAMP)
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◎ Newly Appointed in Organizations or Associations

- Feili LI Member / Atlantic Region Panel, “Climate and Ocean - Variability, Predictability, and Change”
- Dalin SHI Member / Scientific Committee, Association for the Science of Limnology and Oceanography, and the International Society for Limnology 2026 Joint Meeting
- Huijie XUE Member / Scientific Steering Committee, Surface Ocean-Lower Atmosphere Study (SOLAS)
- Jianghui LI Founding Member / Innovation & Cooperation in Naval Architecture & Marine Engineering Association (ICNAME)
- Minhan DAI Member / Awards Committee, Local Advisory Committee of Annual Meeting, Asia-Oceania Geosciences Society
- Minhan DAI Member / Global Future Council, World Economic Forum
- Nianzhi JIAO Chairman / China Committee for Sustainable Marine Ecology under the China Association for Science and Technology
- Tao LIU Vice Chairman / National Committee for the Appraisal of Aquatic Germplasm and Original Species
- Zhimian CAO Vice Chairman / Deep Sea Science Branch Committee, Chinese Society for Oceanology and Limnology

◎ Newly Appointed in Journals

- Bangqin HUANG (黄邦钦) Associate Editor / *Marine Science*
- Bingbing WANG (汪冰冰) Editor / *Atmospheric Chemistry and Physics*
- Dalin SHI (史大林) Associate Editor / *Limnology and Oceanography*
- Dapeng XU (徐大鹏) Editorial Board Member / *Ocean Microbiology*
- Fengling YU (余凤玲) Column Planner / *Shanghai Land & Resources*
- Guang GAO (高光) Subject Editor / *Global Change Biology Communications*
- Haipeng LIU (刘海鹏) Associate Editor / *Developmental and Comparative Immunology*
- Hongyan BAO (鲍红艳) Associate Editor / *Global Biogeochemical Cycles*
- Mingjia SHANGGUAN (上官明佳) Associate Editor / *Remote Sensing for Sustainable Oceans*
- Minwei XIE (谢敏伟) Early Career Editorial Board Member / *Asian Journal of Ecotoxicology*
- Pinghe CAI (蔡平河) Associate Editor / *Geochimica et Cosmochimica Acta*
- Xianhui WAN (万显会) Associate Editor / *Limnology and Oceanography Letters*
- Xing JIAN (简星) Early Career Editorial Board Member / *Journal of Oceanology and Limnology*
- Yao ZHANG (张瑶) Editorial Board Member / *Nitrogen Cycling*
- Yibin HUANG (黄毅彬) Early Career Editorial Board Member / *Oceanologia et Limnologia Sinica*
- Zhimian CAO (曹知勉) Early Career Editorial Board Member / *Journal of Oceanography and Limnology*

© Talks in International / National Conferences

- **Guang GAO.** Carbon sequestration potential and pathways of macroalgae. Climate Solution Marine Forest (Seaweed) International Forum. November 20. Seoul, Korea. (Invited talk)
- **Luzhen CHEN.** Monitoring and Assessment of Blue Carbon Project in Carbon. The 44th plenary meeting of the International Organization for Standardization / Technical Committee 8 Ships and Marine Technology. September 15-19. Istanbul, Turkey. (Invited talk)
- **Minhan DAI.** Predominant biological consumption over physical transport on nutrient budget within mesoscale eddies in the oligotrophic ocean. AOGS 2025 Annual Meeting. July 27-August 1. Singapore. (Invited talk)
- **Minhan DAI.** Evolution and tipping dynamics of complex coastal zone systems. One Ocean Science Congress. June 4-6. Nice, France. (Keynote speech)
- **Minhan DAI.** Carbon fixation & export in ocean deserts (Carbon-FE). Ocean Science and Development Parallel Forum. March 28. Beijing, China. (Keynote speech)
- **Yonglong LU.** Social ecological coupling and sustainable development in China. The 24th Pacific Science Congress. November 20-24. Shantou, China. (Plenary talk)

MEL Publications

Minhan DAI (Lead). 2025. 18 Lectures on Ocean Culture. Xiamen University Press

Working group: Dalin SHI, Zhiyu LIU, Yurui ZHANG, Xiaolin BAI, Jinyu YANG, Zengkai ZHANG, Feifei MENG, Weifang CHEN, etc.



Yihua CAI, Airong ZHENG (Lead). 2025. Marine Chemistry Experiment. Higher Education Press

Working group: Xianghui GUO, Tiantian TANG, Jinyu YANG, Junhui CHEN, etc.



Jiabiao LI, Minhan DAI, Xiaoye ZHANG, Xingwei JIANG (Lead). 2025. Strategic Research on Major Scientific and Technological Issues Related to Deep Participation in Global Ocean Governance. Ocean Press



Dongxing YUAN (Lead). 2025. Fundamental Experiments for Environmental Science. Xiamen University Press

Working Group: Haizheng HONG, Quanlong LI, Guokun LIU, Jian MA, Qiaoguo TAN, etc.

Lixin WU, Xiaopei LIN (Lead). 2025. Physical Oceanography. Higher Education Press

Working group: Zhiyu LIU, Xiaolin BAI, Zhimian CAO, Bicheng CHEN, Hongyang LIN, Kewei LYU, Yue ZHENG



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