J. of Marine Env. Eng., Vol. 12, pp. 171–172
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DOI: 10.32908/JMEE.v12.MERE-Ed

EDITORIAL

A Laboratory's Decade of Milestones: Advancing the Frontier of Marine Engineering Geology and the Environment

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The past decade has witnessed the rapid development of the Shandong Provincial Key Laboratory of Marine Environment and Geological Engineering (MEGE). Established in 2015 by the Shandong Provincial Government and Ocean University of China, MEGE's inception coincided with a critical period for China's marine strategy. This period was defined by the national strategic emphasis on "Building China into a Maritime Power," put forward at the 18th National Congress of the Communist Party of China, and the elevation of the Shandong Peninsula Blue Economic Zone to a national-level initiative. The work of MEGE focused on the complex interactions between geology, engineering, and the environment in marine settings, has contributed to the advancing frontier of this field. As we mark this 10-year anniversary, this editorial reflects on our journey, the foundational principles that have guided us, and the context that shaped our establishment.

During its initial development phase (2015–2018), MEGE defined its core research directions and dedicated to advancing the frontiers of marine engineering geology and the environment. With an emphasis on in-situ observation and the integration of environmental, geological, and engineering studies, key members of the MEGE team received the Second-Class Science and Technology Progress Award of the Ministry of Education of China for their contributions to geological disaster prevention in estuarine deltas. Funding was also secured for the National Key R&D Program project "In-situ Monitoring Technology and Equipment for Soil Mechanics Properties in Trial Mining Areas". These developments culminated in the laboratory's official accreditation in April 2018.

In the subsequent capability expansion phase (2019–2020), supported by the National Key Research and Development Program of China, MEGE extended its in-situ observation

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capabilities from deep-sea areas to full-ocean depths. MEGE researchers also took the lead in establishing the Marine Engineering Geohazards Prevention and Control Branch under the Chinese Society of Rock Mechanics and Engineering (CSRME), further strengthening the laboratory's leadership in the field.

From 2021 to 2022, MEGE achieved major technological innovations. The laboratory developed in-situ monitoring instruments for complex deep-sea engineering geological environments, along with equipment for testing sediment properties at full-ocean depths, representing one of the first efforts of its kind worldwide. These technologies were recognized in both 2021 and 2022 as among the "Top Ten Geological Science and technology progress" by the Chinese Geological Society.

In the current phase of international collaboration and research advancement (2023–2025), MEGE conducted China's first scientific expedition specifically targeting marine geological hazards. The team has also addressed critical issues such as deep-sea fluid-migration hazards and environmental management; these contributions have been recognized with the First-Class Technical Invention Award of the Ministry of Education and the First-Class Science and Technology Progress Award of Shandong Province. The laboratory currently hosts the TC-4 Committee of the International Consortium on Geo-disaster Reduction (ICGdR), further reinforcing its role in global disaster mitigation.

Recently, as part of the provincial key laboratory reorganization, MEGE has integrated with high-quality research resources from Ocean University of China, Changsha Research Institute of Mining and Metallurgy Co., Ltd, and the Sinopec Shengli Oilfield Offshore Oil Production Plant. It will embark on a new journey under the name "Shandong Provincial Key Laboratory of Marine Geotechnical Engineering and Environment," showcasing significant potential for future contributions.

This special issue celebrates the 10th anniversary of MEGE at Ocean University of China by featuring five representative research articles from the laboratory. These studies cover three key areas: coastal protection engineering (Zheng et al., 2025), marine geomorphology and environmental evolution (Feng et al., 2025; Li et al., 2025), and marine pollution and resource management (Meng et al., 2025; Wang et al., 2025). Combining field observations, laboratory experiments, numerical simulations, and engineering technology development, the contributions highlight MEGE's interdisciplinary approach and innovative capabilities, offering valuable insights for both fundamental research and practical engineering applications. Congratulations on MEGE's 10th Anniversary!

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