

Editorial

Exploring the depths: Advancing seabed research in marine and environment

Xianfeng Wang

Guangdong Provincial Key Laboratory of Durability for Marine Civil Engineering, College of Civil and Transportation Engineering, Shenzhen University, Shenzhen 518060, China; xfw@szu.edu.cn

Dear readers of and contributors to *Marine and Environment*,

It is with great pleasure that we present the inaugural issue of *Marine and Environment* for the year, featuring a captivating Section Collection on ‘‘Studies of the Seabed’’. This collection showcases the remarkable progress made in understanding the dynamic nature of the seabed and the vital role it plays in marine ecosystems. These studies explore various aspects of the seabed’s behavior and response to natural and human-induced disturbances, such as earthquakes, landslides, waves, currents, sediment transport, erosion, deposition, mining, drilling, anchoring, cable laying, and offshore structures^[1,2]. As the editorial team, we are thrilled to present a compilation of cutting-edge research articles that delve into the intriguing world of seabed mechanics and dynamics, which has the potential to shape our future in profound ways.

The seabed, a constantly changing environment, offers a wealth of scientific mysteries waiting to be unraveled. This unique realm is governed by intricate geological, biological, and physical processes, which collectively influence marine ecosystems and impact human activities^[3,4]. Through the diligent efforts of researchers worldwide, we have gained new insights into the seabed’s behavior and its profound influence on our planet.

One significant area of study highlighted in this collection is the investigation of sediment transport and deposition. Understanding the formation of seabed features, such as sand dunes, ripples, and mega-ripples, is crucial. Advanced sediment transport models, grounded in fundamental mechanics principles like the Exner equation and the Bagnold formula, have revolutionized our ability to simulate sediment movement caused by waves and currents^[5,6]. By combining field observations and laboratory experiments, scientists have unraveled the complexities of sediment dynamics, leading to a comprehensive understanding of the factors governing transport and deposition patterns.

The exploration of seabed geohazards represents another compelling research area. The occurrence of submarine landslides and gas hydrate destabilization poses significant risks to offshore infrastructure and human safety. To mitigate these hazards, researchers have focused on understanding the mechanics and dynamics of seabed stability. Utilizing geotechnical models and numerical simulations, scientists have made significant strides in identifying the factors that trigger and propagate geohazards^[7,8]. The development of early warning systems based on these insights offers invaluable protection for our offshore endeavors.

Intriguingly, the study of the seabed has not only shed light on potential hazards but also led to the discovery of new resources and ecosystems. Hydrothermal vents and cold seeps, found in the depths of the seabed, harbor thriving ecosystems that endure extreme conditions. Explorations in these areas have unveiled new species and remarkable biotechnological applications. Through the implementation of numerical simulations and laboratory experiments, researchers have unraveled the mechanics and dynamics of fluid flow and heat transfer within these ecosystems^[9,10]. These insights illuminate the processes that sustain these extraordinary habitats, offering valuable lessons for sustainable management and utilization of marine resources.

The application of mechanics and dynamics to the study of the seabed has revolutionized our understand-

ing of this complex and dynamic environment. We have come a long way in deciphering the forces that shape the seabed and drive its ecosystems. By elucidating these intricate processes, researchers have paved the way for the development of innovative technologies and sustainable approaches to marine resource management.

As the editor of the Section Collection of “Studies of the Seabed” in *Marine and Environment*, I would like to express our sincere appreciation to the authors who have shown interest in contributing to this Section Collection. We acknowledge the potential impact of their future contributions in advancing our understanding of the seabed and its intricate mechanics. Additionally, I extend my gratitude to the reviewers for their expertise and commitment to upholding the highest standards of scientific rigor, which will be crucial in ensuring the quality of the forthcoming articles in this section.

We, at *Marine and Environment*, are committed to providing a platform for scientific discourse and knowledge dissemination. As we embrace this new era of research, it is our mission to support and promote the remarkable advancements made in the study of the seabed. We are dedicated to accelerating the peer-review process for the manuscripts submitted, ensuring their timely publication.

In conclusion, it is my belief that the Section Collection on “Studies of the Seabed” will captivate your interest, broadening your understanding of this captivating realm. The papers contained in this issue will undoubtedly inspire further investigations into the mechanics and dynamics of the seabed. Together, let us embark on a journey of discovery, unearthing the mysteries hidden within the depths of our oceans. We look forward to receiving your submissions and working together to advance the study of the seabed for the benefit of our oceans and the planet.

Warm regards,

Prof. Dr. Xianfeng Wang
Editor-in-Chief of *Marine and Environment*

Conflict of interest

The author declares that there is no conflict of interest.

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