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Editorial: Frontiers in marine sciences, social sciences and engineering research related to marine (renewable) energy development

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Editorial on the Research Topic

Frontiers in marine sciences, social sciences and engineering research related to marine (renewable) energy development

Developing renewable energy to address the relationship between economic development and climate change is one of the most important tasks for many countries (Xu et al., 2024). The ocean contains a variety of energy sources, such as wind energy, solar energy, and wave energy (Rui et al., 2024). In the exploitation of ocean energy, various marine structures, including bottom- fixed and floating structures, are employed to promote the development of oil and gas production platforms, offshore wind turbines, wave energy generation devices, etc (Page et al., 2021; Li et al., 2023). The safety of the structures and their foundations is important for ocean energy utilization (Wang et al., 2020; Jostad et al., 2023). Meanwhile, marine energy development involves multiple disciplines, such as marine biology, chemistry, ecology, and the environment. In addition, human activities (e.g., the construction and installation of offshore structures) affect the exploitation of marine energy (Zhou et al., 2021; Wang et al., 2024). This "Frontiers in Marine Sciences, Social Sciences and Engineering Research Related to Marine (Renewable) Energy Development" Research Topic highlights recent developments in the field of marine (renewable) energy development. This Research Topic publishes 10 peer-reviewed articles, which are briefly summarized below.

Seabed flow involves multi-process, multi-physics, and multi-scale processes, all of which are complex natural phenomena. Zhu et al. summarized the basic information on seabed fluid flow in the China Seas to analyze these features, and then the processes and their implications were investigated. The results emphasize the importance of studying how seabed fluids form and migrate to understand their behavior. In addition to seabed flow, seabed properties are also important for offshore construction, such as foundation design

and installation. Amjadian et al. collected 36 sediment samples in a region of the Irish Sea. Particle size analysis was adopted to calculate the properties of the seabed sediments and to acquire more information about the seabed properties,. Seabed soil liquefaction due to cyclic loading results in an obvious decrease in stiffness and strength, which may contribute to the failure of offshore structures. Li et al. proposed a shear wave velocity threshold as a method to assess the liquefaction of unconsolidated soils, and the soil liquefaction potential was evaluated based on one-dimensional and two-dimensional shear wave velocity profiles. In addition, landslides also influence the soil's long-term stability. Zhang et al. comprehensively considered the spatial variability and multiple factors of the landslide to investigate the development of landslides with weak layers. Then, the influences of dry-wet cycles on reservoir landslides and the sensitivity analysis of the random field parameters were assessed.

The above investigations mainly focus on the marine environment, and the stability and safety in offshore structures are also of great significance. Zhu et al. studied the vibration influence on the Qiantang River seawall based on the measurements of the forced vibrations and pulsations of the seawall under various conditions. The acquired data were analyzed in both time and frequency domains, revealing the time-dependent vibration features of such seawall structures. Lu et al. conducted the analysis of cavity expansion during the piezocone penetration using the hardening soil model with small strain stiffness, and considered deformation analysis of underwater tunnels, which is vital for safe construction. Vacuum preloading was used to improve the properties of the dredged slurry. Cai et al. conducted two vacuum preloading model tests and employed particle image velocimetry to capture soil strain paths and displacements. Vortex-induced vibration may cause fatigue in offshore structures. Gao et al. investigated the potential for vortex-induced vibration when the flow interacts with a bluff body, causing oscillations in the wake. Feng et al. conducted model tests for risers under regular waves with different scales to study the scale effect in wave-structure interactions. The riser model is a novel structural design that can be considered a beam. Tidal turbines are one way of exploiting ocean tidal energy, but the exploitation of tidal power is influenced by the effects of fish-turbine interactions. Peraza et al. combined empirical acoustic density measurements and investigated probabilities in a probability model that considers the interaction between fish and tidal turbines, including fish collisions with stationary turbine components, blade strikes by rotating blades, and/or a collision followed by a blade strike.

In summary, this Research Topic published ten papers on marine sciences and engineering related to marine energy. Some papers focus on the marine environment, while others investigate marine structures. Addressing the problems of marine (renewable) energy can build a better world.

Author contributions

SR: Data curation, Investigation, Validation, Writing – original draft. ZG: Project administration, Resources, Writing – review & editing. ZZ: Conceptualization, Data curation, Formal analysis, Writing – review & editing. ZW: Formal analysis, Resources, Writing – review & editing. GY: Conceptualization, Methodology, Writing – review & editing. DM: Validation, Visualization, Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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