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Editorial: Hydrodynamic characteristics and pollutant transport in rivers and nearshore environments

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Editorial on the Research Topic
Hydrodynamic characteristics and pollutant transport in rivers and nearshore environments

Wang et al. simulated the structural deformation and failure problem in fluid-structure interaction (FSI) based on models. This field of study is helpful in many engineering operations such as material selection, the study of fatigue damages and the estimation of structural life. The problem was that the original TLSPH (total Lagrangian smoothed particle hydrodynamics) method could not simulate structural cracks and their propagation, and the fracture model based on TLSPH was established. The present coupled WC-TLSPH (weakly compressible - TLSPH) model can accurately simulate the FSI problem where the figurative fracture process is involved, indicating the compromised potential of the established model to simulate the elastoplastic structural failure in scientific and industrial applications.

Shi et al. used remote sensing techniques to estimate dissolved oxygen (DO) concentration by applying a crucial means of water quality monitoring. They propose a novel model for DO concentration estimation in water bodies, termed Dissolved Oxygen Multimodal Deep Neural Network (DO-MDNN), which utilizes synchronous satellite remote sensing data for real-time DO concentration inversion. Using Lake Taihu as a case study, they validate the DO-MDNN model using Himawari-8 (H8) satellite imagery as input data and actual DO concentration in Lake Taihu as output data. Results demonstrate that the DO-MDNN model exhibits high accuracy and stability in estimating DO concentration inversion. This method holds significant practical value in enhancing the efficiency and precision of water quality monitoring.

With the development of societies and economies, the process of industrialization and urban modernization is accelerating, urban populations are increasing, and more and more wastewater is generated and released. Large quantities of hazardous industrial and agricultural wastewater and domestic sewage are discharged directly into reservoirs, lakes, rivers and the sea, without adequate treatment. The wide range of pollutants discharged can degrade, interact, and transform in aquatic environments. Rivers are the main channels of pollution transport from land-based activities within watersheds. Various

types of pollutants produced on land are transported downstream to estuaries and coastal areas through river networks, forming land-sea pollution transport chains. A large amount of terrigenous material is confined to the nearshore area when runoff, river discharge, and other processes deposit these materials on the continental shelf. Terrestrial water is usually rich in nutrients, pollutants and sediment, and their offshore diffusion through water bodies has an important impact on marine primary productivity, biological diversity and geochemical processes. The transport and diffusion of pollutants and changes in their concentration are affected by hydrodynamic forces. Therefore, the exploration of solid matter and organic matter content, diffusion processes and controlling factors in water bodies is of great significance for understanding the ecological environments of river and coastal systems under variable hydrological conditions and climate change.

Nine papers constitute this Research Topic mainly involving watershed hydrology, pollution transport, surface and groundwater quality and water quality monitoring. Due to the complex and variable processes of watershed hydrology, pollutant transport and diffusion, this Research Topic will attract scholastic attention to the hydrological, water quality and ecological characteristics of estuarine and nearshore environments and the mechanisms and interactions of the water environment and biota. Water environment, pollutant transport and biota.

Wang et al. analyzed bacterial composition, diversity, community composition and geographical distribution in lake water of three adjacent regions on the Qinghai Tibet Plateau (QTP). Results from 16S rRNA gene sequencing illustrate that bacterial alpha-diversity indices are much lower in the Hoh Xil (HX) than in the Yellow River Headwater (YRH) and Qaidam (QD) regions. Redundancy analysis suggests that the most important factors driving bacterial community composition in the three regions are altitude (QD), total nitrogen (YRH), and pH (HX). The results of this study provide insight into differences in bacterial features of lakes at the regional scale and the main drivers of community composition, thereby offering guidance on the protection and management of these plateau lake ecosystems.

Wang et al. use high throughput sequencing to explore archaeal communities in seawater from the hypoxic and non-hypoxic zones of the Changjiang (Yangtze) Estuary, China. Thaumarchaeota dominated archaeal communities in the hypoxic zones (bottom water), and Euryarchaeota were mainly distributed in the non-hypoxic zones (surface water). Archaeal richness was significantly influenced by DO, while archaeal diversity was influenced by nutrient levels. This study elucidated the shift in community structure of archaea caused by hypoxia in the Changjiang Estuary, and laid a foundation for future studies on the ecological patterns and functions of archaea in estuary ecosystems.

Ruan et al. took a section of the Yellow River in China from the Xiaolangdi Dam to Gaocun as their research area and analyzed the spatial distribution of Yellow River carp (*Cyprinus carpio*) spawning before (1980-1990) and after (2006-2018) the construction of Xiaolangdi Dam. This study shed light on the response of the Yellow River carp to hydrological and physical habitat changes after the construction of this dam. Construction and operation of the Xiaolangdi Dam decreased the extent of spawning reaches by 16.23%, delayed the breeding time of the carp and greatly affected larval fish development. Thus, this study provides a reference for restoring the spawning habitat of the Yellow River carp and for the scheduling of discharges from the Xiaolangdi Dam to provide for the reproductive needs of the carp.

With fair precision, Li et al. collected a series of water samples from six different rivers in China whose sediment concentration and size distribution vary widely and analyzed their phosphorus (P) properties in the laboratory. From this analysis of field samples, a highly consistent comet-shaped pattern of sediment effects on P is revealed, i.e., generally, the range of concentration of total P has a diverge-converge trend as the sediment concentration increases. The regime of fluvial P constituted by sediment obtained in this study serves as a knowledge base for further investigation of this fundamental biogeochemical cycle.

Ren et al. analyzed the evolution of intercrystalline brine in the Kunteyi Basin, China, based on major ionic concentrations and isotopic ratios (δ^2H, $\delta^{18}O$, and $\delta^{11}B$). The results show that the intercrystalline brine has a much higher concentration of total dissolved solids compared with oil-field brine. Results indicate that thermal water recharged the Pleistocene layer, reacted with polyhalite, and formed Mg- and K-rich brine. This solution rose along the channel formed by the Shuangqiquan Fault and was supplied to the shallow intercrystalline brine. Research on the origin of brine informs understanding of the process of mineral formation and improves the efficiency of mineral exploitation.

With fair precision, Liu et al. researched the Bingham fluid flow on a slope using a corrected smooth particle hydrodynamics (CSPH) method based on periodic density re-initialization and artificial stress. Results show that the CSPH method can accurately simulate the rheological behavior of the Bingham fluid, such as shear thinning. Furthermore, the numerical results with a large range of incline angles are given to prove the effectiveness and stability of the improved SPH (smooth particle hydrodynamics) method, which can effectively capture the complex transient flow behavior of Bingham fluid and be applied to large-scale and real scene debris flow numerical simulation with parallel technology.

Liu et al. studied the movement characteristics of *Oncomelania* (the snail intermediate host of schistosomiasis along rivers and irrigation schemes) using image recognition and wavelet analysis. They developed a simple settling velocity model that can predict the terminal velocity of *Oncomelania* fairly with several easy-to-measure parameters. These findings provide a basis for the further improvement of the hydraulic schistosomiasis control project and also supply a reference model for the settling characteristics and drag coefficient of cone-shaped particles.

Author contributions

BG: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing–original draft, Writing–review and editing. MV: Conceptualization, Data curation, Visualization, Writing–review and editing. SX: Data curation, Formal Analysis, Investigation, Resources, Validation, Writing–review and editing.

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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.

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