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Editorial: Frontiers in water: Rising stars 2021

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Editorial on the Research Topic Frontiers in water: Rising stars 2021

Providing access to clean water is one of the 14 grand challenges listed by The National Academy of Engineering in the United States. A report of the 2021 Davos agenda of the World Economic Forum, while referring to the 17 Sustainable Development Goals (SDGs) set forth by the United Nations, is provocatively entitled: “If you want to make progress on all the major global challenges, start with water.”

Water resources including quantity and quality, water-related extremes such as floods and droughts, and the nexus of water with food, energy, infrastructures, lifelines, health, ecosystems, socioeconomics, and diplomacy, remain among the most urgent societal challenges. From climate change (Figure 1) and population movement to sociopolitical upheavals and economic progress, water remains central to our shared future. However, our knowledge of processes impacting and impacted by water remains incomplete, which leads to cascading uncertainties in scientific understanding of global challenges and becomes a barrier to generating actionable insights. Notwithstanding this urgency and significance, the description of best practices in water in the research literature remains fragmented and unwieldy, with limited integration across disciplinary fields and limited understanding or use of modern technologies. Yet there is hope. Our aspiration as the editors of Frontiers in Water has been to develop an open-access strategy to develop knowledge across water-related disciplines. To explore where we need to be as a field, we have invited a few rising stars who are boldly and creatively leading the way into the future by contributing articles that may provide a glimpse of the future. This brings us to a discussion of the 10 articles—from authors based in South and North America, Asia, and Europe—which together comprise this *Frontiers in Water Rising Stars 2021* collection.



FIGURE 1
Saint Mary Lake with a view of the Wild Goose Island in Glacier National Park, Montana, USA. Climate variability and change are beginning to have noticeable impacts on the glaciers with implications for regional freshwater and ecosystems. Photo credit: Debashree Bagchi Ganguly. Date: 18th August, 2022 CE.

Bänziger et al. from Switzerland and Nepal have developed risk-informed interventions to improve microbial water quality in rural Nepal in their original research article. Their insights and methods are likely to inform future studies and practices in low-income countries. Navato and Mueller from Boston describe novel adaptations of data-driven approaches for automated anomaly detection in wastewater influents. The methods and insights reported in their brief research report were validated based on changes during the SARS-CoV-2 pandemic. The perspective article by van Emmerik et al. from Wageningen in the Netherlands discusses how river systems act as reservoirs of plastic. Insights on retention mechanisms and the fate of plastics in riverine systems can be directional for our understanding of plastic pollution, which has been described by the United Nations Environmental Programme (UNEP) as a global problem. The original research article by Li et al. from Berkeley develops a framework to understand the pore-scale dynamics of two-phase flow and its implications for mineral reaction rates. Their pore-scale simulations and results suggest how mineral reactions are controlled by interfacial dynamics involving multiphase flow, transport, and surface reactions. The original research article by Nair et al. from India examines the ability of Surface Water and Ocean Topography (SWOT) data products to monitor water volumes in lake levels. A case study in a lake in Kerala, India suggests the possibility of new SWOT-based insights on anthropogenic impacts on and monitoring levels of lakes. A review article by Ghorpade et al. from Mumbai evaluates current literature on Intermittent Water Supply (IWS) in India. They discuss India's water supply system, as well as the drivers and the mechanisms of IWS, including what they call the vicious cycle of IWS in India. Ceola et al. from Italy, Bristol the United Kingdom, and Luxembourg, study flood risks and flood mitigation strategies in their original research article. Based on a hydrodynamic model and satellite-derived data, they

investigate the dynamics of the components of flood risks with a case study on the Murray-Darling basin in Australia. Samadi from Clemson in the USA reports how what the article calls the Artificial Intelligence of Things can advance research on floods in an original research article. The vision was demonstrated through a prototype and discussion on the workflow of a flood analytics information system. The original research article by Ricardo et al. from the USA, Costa Rica, and Argentina, characterizes dissolved organic carbon variations in an elevated peatland of the Talamanca range of Costa Rica. Their insights and data on understudied high-elevation peatlands in a tropical coastal lowland point to new directions for further studies and provide a baseline, with implications for associated ecosystems. Iloejesi and Beckingham from Auburn in the USA examine the geochemical implications on subsurface porous aquifers during carbon dioxide injection, storage, and extraction. Given that such aquifers act as reservoirs for compressed energy storage of renewable energy, their original research article provides insights into an important aspect of the water-energy nexus.

The 10 articles cited above touch upon water quality and availability, flood hazards, as well as the nexus of water with ecosystems and energy. The rising stars and their co-authors are drawn from South and North America, Europe, and Asia, reflecting water-related opportunities and challenges in the global south and the global north. The depth and breadth of the articles are expected to provide new directions to water researchers and practitioners around the world.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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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