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EDITED AND REVIEWED BY
Hayley Jane Fowler,
Newcastle University, United Kingdom

*CORRESPONDENCE
Miaoni Gao,
✉ gaomn@nuist.edu.cn

RECEIVED 20 June 2025
ACCEPTED 27 June 2025
PUBLISHED 03 July 2025

CITATION

Jiang T, Kundzewicz ZW, Su B, Gao M, Zhai J, Liu Y and Hartmann H (2025) Editorial: Extreme hydro-meteorological events in a changing climate: monitoring, risk assessment, and early warning. *Front. Earth Sci.* 13:1650815. doi: 10.3389/feart.2025.1650815

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Editorial: Extreme hydro-meteorological events in a changing climate: monitoring, risk assessment, and early warning

Tong Jiang^{1,2}, Zbigniew W. Kundzewicz³, Buda Su²,
Miaoni Gao^{2*}, Jianqing Zhai⁴, Yingjie Liu⁵ and Heike Hartmann⁶

¹Laboratory for Climate Risk and Urban-Rural Smart Governance, School of Geography, Jiangsu Second Normal University, Nanjing, China, ²State Key Laboratory of Climate System Prediction and Risk Management, Nanjing University of Information Science and Technology, Nanjing, China, ³Department of Hydrology, Meteorology and Water Management, Warsaw University of Life Sciences, Warsaw, Poland, ⁴National Climate Center, China Meteorological Administration, Beijing, China, ⁵Public Meteorological Service Center, China Meteorological Administration, Beijing, China, ⁶Department of Chemistry and Environmental Geosciences, Slippery Rock University of Pennsylvania, Slippery Rock, PA, United States

KEYWORDS

extreme hydro-meteorological events, climate change, risk assessment, early warning, risk reduction

Editorial on the Research Topic

[Extreme hydro-meteorological events in a changing climate: monitoring, risk assessment, and early warning](#)

In many areas of the globe, extreme hydro-meteorological events are becoming more extreme in a changing climate. Their frequency, intensity, duration as well as the area of their occurrence tend to increase in many regions. Therefore, research on monitoring, forecasting, early warning, and risk assessment related to hydro-meteorological extremes is becoming increasingly important and relevant. This underscores the rationale for assembling a collection of articles contributing to a multi-disciplinary Research Topic in *Frontiers in Environmental Science* and *Frontiers in Earth Science*. The papers in this collection cover a range of themes contributing to the broad area encompassed by the title of the Research Topic.

All papers in this Research Topic refer to Asia, where approximately 60% of the Earth's inhabitants live, making the continent more populous than all the remaining continents together. Much of Asia is characterized by high levels of hazard, exposure, vulnerability, and risk related to hydro-meteorological disasters.

The present Research Topic is of considerable scientific interest and broad applicability, addressing two communities of experts—the disaster risk reduction (DRR) community as well as the climate change adaptation (CCA) community. The collaboration between these two communities is very important for solving the severe problems humanity is facing.

The papers in this collection were co-authored by experts from three countries—China (six papers (Mo et al.; Cao et al.; Dai et al.; Jiang et al.; Song and Li; Shi et al.)), Pakistan (Ibrahim et al.), and Iran (Valizadeh et al.) (one paper each). The presented studies

specifically refer to these three countries. Yet many results and proposed methodological advances are applicable to other countries as well. Four papers (Mo et al.; Cao et al.; Song and Li; Valizadeh et al.) deal with various aspects of early warning systems (EWSs). Some papers are devoted to specific types of hydro-meteorological extremes, such as droughts (one paper (Dai et al.)), heavy precipitation and floods (three papers (Jiang et al.; Shi et al.; Ibrahim et al.)), and typhoons (one paper (Song and Li)).

In a paper addressing multi-hazard warning (Mo et al.), a prioritization algorithm is proposed that aids in managing queue systems. Another paper (Valizadeh et al.) examines factors affecting the willingness to use meteorological information and predictions to reduce agro-meteorological hazards. In a further study (Cao et al.), a delivery strategy tree for issuing warnings to decision makers is established, based on the warning efficiency index and the reminder strength of delivery means.

A study on the effects of anthropogenic climate change on meteorological drought in China (Dai et al.) helps formulate more effective strategies for managing meteorological drought risks. This study used both observational data and counterfactual climate data (i.e., detrended observations), for the time interval 1960-2019. The results show a complex pattern, being period and region specific, with climate variability playing a role.

One can argue that global climate change has intensified the water cycle. More frequent extreme precipitation events pose a significant threat to railway infrastructure and safety operations (Jiang et al.). The study examines past (observed) and future (projected) precipitation changes in China. Compared to the 20th century, all projections indicate that the total annual heavy precipitation hours, railway inspections, total of imposing speed limit, and closure risk hours are likely to increase on the national scale.

Vulnerability of settlements to floods is examined in a case study from Pakistan (Ibrahim et al.), where millions of people are annually affected by floods and where changes in monsoon precipitation play a role. Four indicators used in the study read: population density, land average gross domestic product, distance between settlements and rivers, as well as land use and land cover. The findings include maps and information for stakeholders to support effective vulnerability management in the study area.

The effectiveness of Rural Loudspeaker Systems (RLS) and Typhoon Warning Signals (TWS) is discussed (Song and Li). It is found that increased RLS coverage is associated with a reduction in injuries and casualties. RLSs are indeed an important dissemination tool to inform individuals in the countryside and to guide their behavior during typhoon events.

Finally, the relationship between flood deposits, rainfall and flooding in the Loess Plateau of China over the last 50 years is studied (Ibrahim et al.). This research aims to read the archives of the Earth system, deciphering the past from proxy information.

Author contributions

TJ: Conceptualization, Writing – review and editing. ZK: Writing – original draft. BS: Writing – review and editing. MG: Writing – review and editing. JZ: Writing – review and editing. YL: Writing – review and editing. HH: Writing – review and editing.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. The work was supported by the International Cooperation Program between the National Science Foundation of China (NSFC) and the United Nations Environment Programme (UNEP) (grant no. 42261144002).

Conflict of interest

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