frontiers | Frontiers in Water

TYPE Editorial
PUBLISHED 06 February 2023
DOI 10.3389/frwa.2022.1121534



OPEN ACCESS

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SPECIALTY SECTION
This article was submitted to Water and Hydrocomplexity, a section of the journal Frontiers in Water

RECEIVED 11 December 2022
ACCEPTED 23 December 2022
PUBLISHED 06 February 2023

CITATION
Siddique R, Sharma S and McCreight J (2023) Editorial: Hydrological modeling, analyses, and predictions: Opportunities and challenges. *Front. Water* 4:1121534. doi: 10.3389/frwa.2022.1121534



# Editorial: Hydrological modeling, analyses, and predictions: Opportunities and challenges

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KEYWORDS

**water and hydrocomplexity, hydrologic modeling, hydrologic forecasting, machine learning, uncertainty**

Editorial on the Research Topic
Hydrological modeling, analyses, and predictions: Opportunities and challenges

Hydrological forecasts are critical to inform decision-making in various areas of water policy and management, including flood and drought preparedness, reservoir operation, and agricultural planning. The skill of hydrologic prediction depends critically on the quality of inputs in addition to the details of the hydrologic models themselves.

It is assumed that meteorological forcing error contributes significantly to the overall hydrological model prediction errors. One article in this collection quantifies how errors in precipitation translate to streamflow prediction errors, underscoring that improving and understanding hydrometerological fields remains a critical endeavor for hydrologists (Bárdossy et al.). Improving other environmental datasets as inputs to hydrologic models remains another prominent challenge. A second paper in the collection aims at generating synthetic river images for understanding and modeling river dynamics and geomorphology (Gautam et al.). Highlighting the importance of both meteorological and non-meteorlogical data for predicting hydrologic response, another paper in the collection demonstrates the importance of soil moisture anomalies, in addition to precipitation anomalies, for predicting groundwater table dynamics (Ma et al.).

Hydrologic models are constantly evolving with ideas coming from other domains. In particular, advances in deep neural networks have opened up new avenues of predictability in hydrology. A prominent neural network model used for streamflow prediction, the LSTM, is applied in a new hydrologic context (groundwater anomaly prediction) in this collection (Ma et al.). The creation of synthetic river images is also performed by neural networks in an application of Generative Adversarial Networks

(Gautam et al.). Another article in the collection turns to so-called "small-world" networks to help quantify streamflow timeseries predictability and to classify its underlying dynamics as chaotic or stochastic (Ghimire et al.). These novel approaches to hydrologic process prediction and characterization advance the state of the science in important ways and help keep the field abreast of modeling developments in the broader scientific and engineering communities.

## 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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