

# On recognizing uncertainty in hydrological forecasting: mapping Pappenberger and Beven's code of practice, principles, and the way forward

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August 11, 2023

## Abstract

In the last decade, recognizing and reducing uncertainties in hydrological forecasting has shown renewal interest. However, from a modeler's perspective, a unified code of practice is always needed to handle the various facets of uncertainty in hydrological forecasting. Pappenberger and Beven, (2006) suggested nine codes of practice for handling uncertainties in hydrological modelling. In this paper, we have revisited those principles and added new insights to yield seven key principles for accounting and reducing uncertainties in catchment related hydrological forecasting tasks: (1) objectives define the need for uncertainty, (2) exploring the Catchment Puzzle, (3) selection of models is key, (4) choices of the method for quantifying uncertainties and calibration (5) finding the sources of uncertainties (6) advancements are a critical choice (7) prioritizing End User Needs for Reliable Forecasting Services. We derive these principles as a summary of understanding how modelers across the world have approached uncertainty handling from the analysis of recent literature on reducing uncertainties in hydrological forecasting. The triangulated interdependence and uncertainty contributions between the hydrological processes, epistemic uncertainties, and model development inevitably impact the forecast. Yet, the mapping of these principles provided in this study can assist the modelers in developing an improved framework for hydrological forecasting. Further, this work calls for discussions among the hydrological science community to establish these principles.

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