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Uncertainty assessment with Bluecat: Recognising randomness as a fundamental component of physics

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We present a new method for simulating and predicting hydrologic variables and in particular river flows, which is rooted in the probability theory and conceived in order to provide a reliable quantification of its uncertainty for operational applications. In fact, recent practical experience during extreme events has shown that simulation and prediction uncertainty is essential information for decision makers and the public. A reliable and transparent uncertainty assessment has also been shown to be essential to gain public and institutional trust in real science. Our approach, that we term with the acronym "Bluecat", assumes that randomness is a fundamental component of physics and results from a theoretical and numerical development. Bluecat is conceived to make a transparent and intuitive use of uncertain observations which in turn mirror the observed reality. Therefore, Bluecat makes use of a rigorous theory while at the same time proofing the concept that environmental resources should be managed by making the best use of empirical evidence and experience and recognising randomness as an intrinsic property of hydrological systems. We provide an open and user friendly software to apply the method to the simulation and prediction of river flows and test Bluecat's reliability for operational applications.