## Confronting uncertainties in hydrological forecasting

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Uncertainties are prevalent in all phases of hydrological forecasting. For hydrological forecasts to be useful to our society, those uncertainties must be quantified and/or reduced. In this lecture, I will discuss the properties of uncertainties in hydrological forecasting and the various ways to confront them. Depending on their sources, uncertainties manifest themselves differently and require different statistical methods to describe them. There are three different ways to deal with uncertainties in hydrological forecasts: (1) improving our knowledge of the physical mechanisms involved in hydrological processes and building better hydrological models by incorporating this knowledge; (2) improving our ability to observe hydrological processes and developing better data assimilation and model calibration methods to merge observations and model simulations; (3) developing better data learning methods to unearth the intrinsic values in observations and model simulations. Plenty of examples will be used to illustrate uncertainty concepts and some of the state-of-the-art methods in dealing with them. The lecture will end with a perspective on challenges and future directions.