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Squaring the Circle: The hydro-meteorological forecast chain (Arne Richter Award for Outstanding Young Scientists Lecture)

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Hydro-meteorological/climatological forecasts and prediction of extremes rely on a chain of uncertain forcings, many barely known boundary conditions, inadequate models, rough estimates of observations and so forth. The interactions between and importance of these uncertainties depends on a multiplicity of factors for example the desired lead time, the predictor or the flow regimes. The outcomes are inevitably uncertain forecasts. The discharge hydrograph is not anymore a single line, but a distribution. Evaluating the quality of these forecasts is far beyond trivial and we are even often unable to quantify how wrong we actually are in our extreme predictions. If we want these forecasts used, then we must also endeavour to effectively communicate these uncertainties as well as supporting decision making frameworks, which goes far beyond pretty pictures and boring scientific explanations. The latter is the most important challenge of all of them.

In this talk I will discuss 5 recent examples from my work on flood prediction and outline the difficulties but also point to the recent advances that are being made in this field and the exciting challenge of pushing the boundaries of our ability to predict river flow. I will show examples of a pre-operational continental medium range flood forecast illustrating the importance of pre and post processing. I question whether a global forecast system could be a Fata Morgana. I will discuss the role of remote sensing and venture into the climatic and decadal scale. Finally, I will discuss the role of uncertain predictions in the communication process and decision making.