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Simple, but not too simple: Some thoughts on uncertainty and extrapolation

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The quote "Everything should be made as simple as possible, but not simpler", attributed to Albert Einstein, espouses the principle of parsimony. How should such a principle be applied in stochastic hydrology? The seminal work by Box and Jenkins on time series analysis leads the way. However, its uncritical application may be problematic. Our practical interest is often in the tails of probability distributions where observational evidence is limited or non-existent. Extrapolation thus becomes a necessity, while the justification for anything but the simplest probabilistic model is difficult. In cases where "soft" evidence may favour hypotheses more complex than supported by the limited "hard" evidence, a more nuanced approach is needed, particularly if there is societal risk in adopting models that are "too simple". Using examples from flood and drought hydrology this talk explores the use of a decision-oriented perspective aided by analysis of parameter uncertainty and multiple lines of evidence to help guide the selection of models that are not "too simple".