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Dynamic flood modelling: Combining Hurst and Gumbel's approach'

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When modeling flood, how can Hurst and Gumbel be correct at the same time ? Hurst stated that river maxima were strongly dependent (long rang) but Gumbel stated that they were i.i.d. and that usual extreme value theory can be used. Can we still use it if data are strongly dependent ? The idea might be to use high-frequency financial model to model more precisely the underlying process.