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# Rainfall fields simulation to improve flood hazard and flood risk assessment

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Probabilistic flood hazard mapping often consist in estimating the flood quantile of the desired return period upstream a stretch, and run a hydraulic model down to the next confluence, where a next flood quantile is to be estimated. This allows to draw monofrequency maps, where the frequency is the same but contributions at a confluence are not additive.
This approach has drawbacks. First, the mitigating (or accelerating) effect, of a hydraulic feature on one stretch can not be easily taken into account in the downstream stretch, especially when regional hydrology methods are used to estimate the flood quantiles. So, this effect is often neglected.
Then, the rainfall spatial patterns has a large influence on flood generation and it has an even larger impact on flood risk mitigation efficiency especially when structural measures are scattered on the catchment. Approaches based on monofrequency design hydrographs miss this variability. This is why we develop an approach based on continuous simulation rainfall fields (with SAMPO model), long enough to be representative of the rainfall variability in space and time. A conceptual rainfall-runoff model then computes the resulting discharges over the hydraulic network, and the resulting discharge time-series accounts for the effect of the measures for this large number of rainfall patterns. Initial conditions before floods events are also given by the model, being variables of the model (water levels in storage basins).
Therefore, instead of running a few hydrographs assumed to be representative of a given return period, the goal is to capture the variability of the processes in hydraulic time-series, and even go as far as distributed damage time-series. The estimation of a return-period comes only in the latest stage, and damages time-series thus analyzed yield better Estimated Annual Damages for flood risk assessment, especially where effect of structural measures are significant.