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Testing rainfall envelope curves against stochastically generated rainstorms – a regional analysis

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The concept of the regional envelope curve (REC) of flood flows was recently extended to extreme rainstorm events by introducing the Depth-Duration Envelope Curves [DDEC, Castellarin et al., J. Hydrol., 2009]. The authors define DDEC as regional upper bounds on observed rainfall maxima for several rainfall durations and provide a probabilistic interpretation of the curves, enabling one to estimate the exceedance probability of the envelope curves themselves (or equivalently their recurrence interval T). Even though probabilistic DDEC may in principle be used to retrieve point rainfall quantiles for ungauged sites, the assessment of the reliability of envelope rainfall-quantiles is not an easy task due to the large or very large T values associated to DDEC. In this study we derive DDEC for a wide study region in Austria for durations ranging from 15 min. to 24 hr. and we estimate the corresponding T values. Then, for each raingauge in the study area we calibrate a suitable rainfall model and generate very long rainfall series. Probabilistic DDEC constructed for the study area are then compared with the rainfall quantiles estimated from the long synthetic series. The comparison is twofold: (1) verify how realistic probabilistic envelope curves are for the study area and (2) assess the reliability of rainfall quantiles obtained for large T-values from long synthetic series.