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Extreme rainstorms: testing regional envelope curves against stochastically generated events

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The concept of regional envelope curves of flood flows was recently extended to extreme rainstorm events by introducing the Depth-Duration Envelope Curves (DDEC). DDEC are defined as regional upper bounds on observed rainfall maxima for several rainfall durations, and their probabilistic interpretation enables one to estimate the exceedance probability (or equivalently recurrence interval T) of the curves themselves. 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. Also, DDEC were defined and tested only relative to a very specific geographical and climatic region. In this study we derive DDEC for a wide study region in Austria for durations ranging from 15 min to 24 h and we estimate the corresponding T values. Then, for a subset of 21 raingauges, which are representative of the climatic conditions of the entire area, we calibrate a stochastic rainfall generator and generate very long (i.e., 50 000 years) 15 min rainfall series. Probabilistic DDEC constructed for the study area are then compared with 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 rainfall series.