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Probabilistic depth-duration envelope curves for Austria and Italy

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A regional envelope curve (REC) of flood flows summarises the current bound on our experience of extreme floods in a region. RECs are available for most regions of the world. Recent scientific papers introduced a probabilistic interpretation of these curves and formulated an empirical estimator of the recurrence interval T associated with a REC, which, in principle, enables us to use RECs for design purposes in ungauged basins. The main aim of this paper is twofold. First, it extends the REC concept to extreme rainstorm events by introducing the Depth-Duration Envelope Curves (DDEC), which are defined as the regional upper bound on all the record rainfall depths at present for various rainfall duration. Second, it adapts the probabilistic interpretation proposed for RECs to DDECs and it assesses the suitability of these curves for estimating the T-year rainfall event associated with a given duration and large T values. Probabilistic DDECs are complementary to regional frequency analysis of rainstorms and their utilization in combination with a suitable rainfall-runoff model can provide useful indications on the magnitude of extreme floods for gauged and ungauged basins. The study focuses on two different national datasets, the peak over threshold (POT) series of rainfall depths with duration 30 min., 1, 3, 9 and 24 hrs. obtained for 700 Austrian raingauges and the Annual Maximum Series (AMS) of rainfall depths with duration spanning from 5 min. to 24 hrs. collected at 220 raingauges located in northern-central Italy. The estimation of the recurrence interval of DDEC requires the quantification of the equivalent number of independent data which, in turn, is a function of the cross-correlation among sequences. While the quantification

and modelling of intersite dependence is a straightforward task for AMS series, it may be cumbersome for POT series. This paper proposes a possible approach to address this problem.