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Probabilistic regional envelope curves for design-flood estimation in northern-central Italy

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The accurate estimation at a given location of the flood magnitude associated with the recurrence interval T (the so-called T-year flood) is a crucial task for designing river engineering works and hydraulic structures, or defining regional-scale policies for flood risk mitigation. Regional flood frequency analysis is widely employed for estimating flooding potential when dealing with ungauged sites or data record lengths that are short as compared to the recurrence interval. Castellarin et al. [Geophys. Res. Abs., (6) 01645, 2004] present a probabilistic interpretation of the regional envelope curve (REC) that relies on an extension of the index-flood hypothesis, and propose an estimator of the exceedance probability associated with an REC that accounts for the impact of inter-site cross-correlation of floods. Potential advantages of assigning a nonexceedance probability (i.e., a recurrence interval T) to an REC are that 1) this approach avoids the need to extrapolate an assumed at-site flood frequency distribution when estimating a design event and 2) a non-parametric estimate of the T-year flood for any ungauged sites in the region can be easily computed from the catchment area alone. Our study addresses the problem of estimating the design flood at ungauged sites and compares the accuracy of the T-year flood estimates resulting from well-known and established regionalisation techniques with the accuracy of non-parametric estimates retrieved from an REC. The study area consists of 81 unregulated Alpine and Apenninic catchments located in northern-central Italy, for which the preliminary results of the study indicate that a probabilistic REC offers a viable and effective alternative for estimating the design flood at ungauged locations.