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Supplement of

Reducing reliability bias in assessments of extreme weather risk using calibrating priors

Stephen Jewson et al.

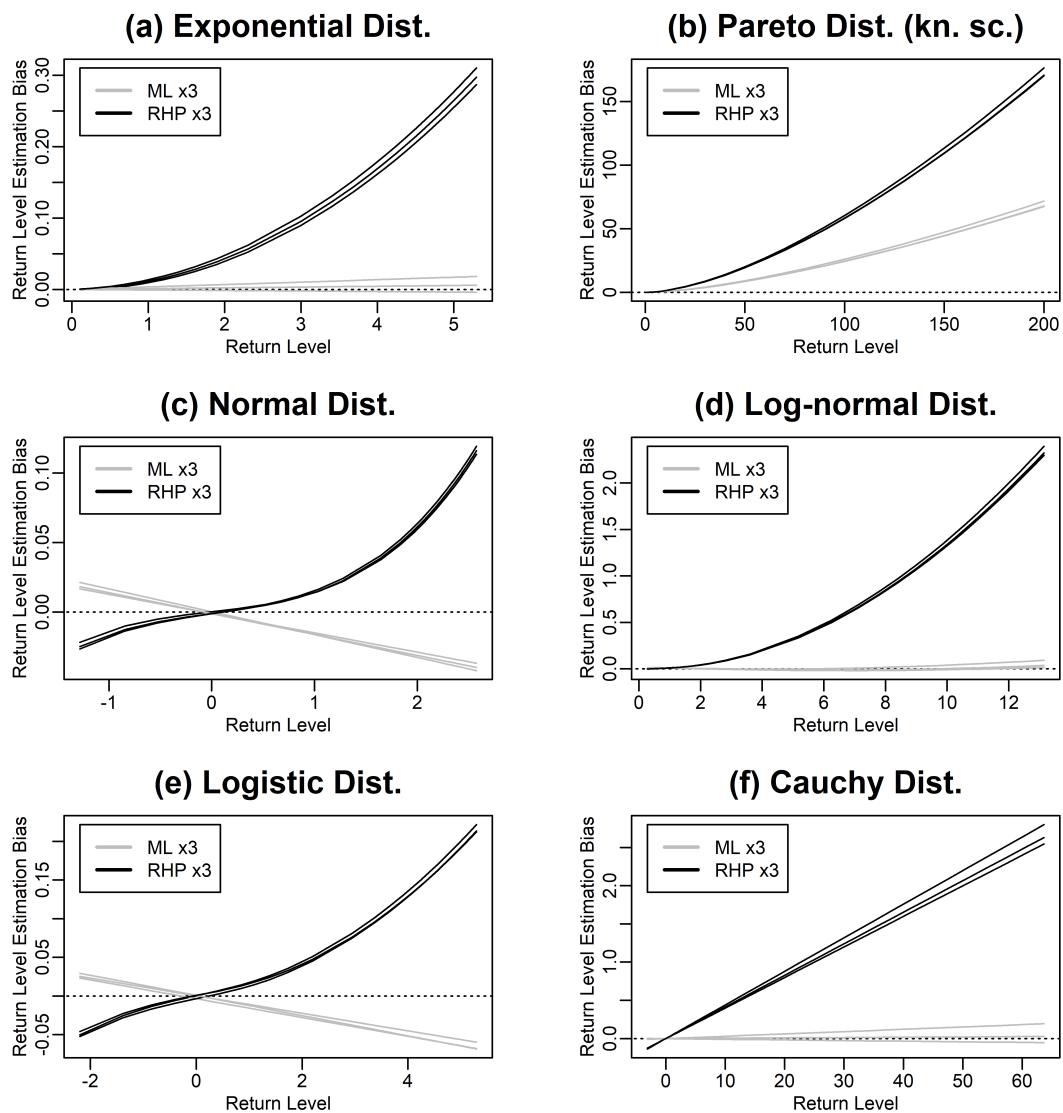*Correspondence to:* Stephen Jewson (stephen.jewson@gmail.com)

Figure S1. Return level sampling bias versus return level for predictions generated using maximum likelihood (ML, grey) and right Haar priors (RHP, black), for various distributions. Each panel shows 6 lines, consisting of 3 lines from 3 independent evaluations of the performance of maximum likelihood, and 3 lines from 3 independent evaluations of the performance of RHP.
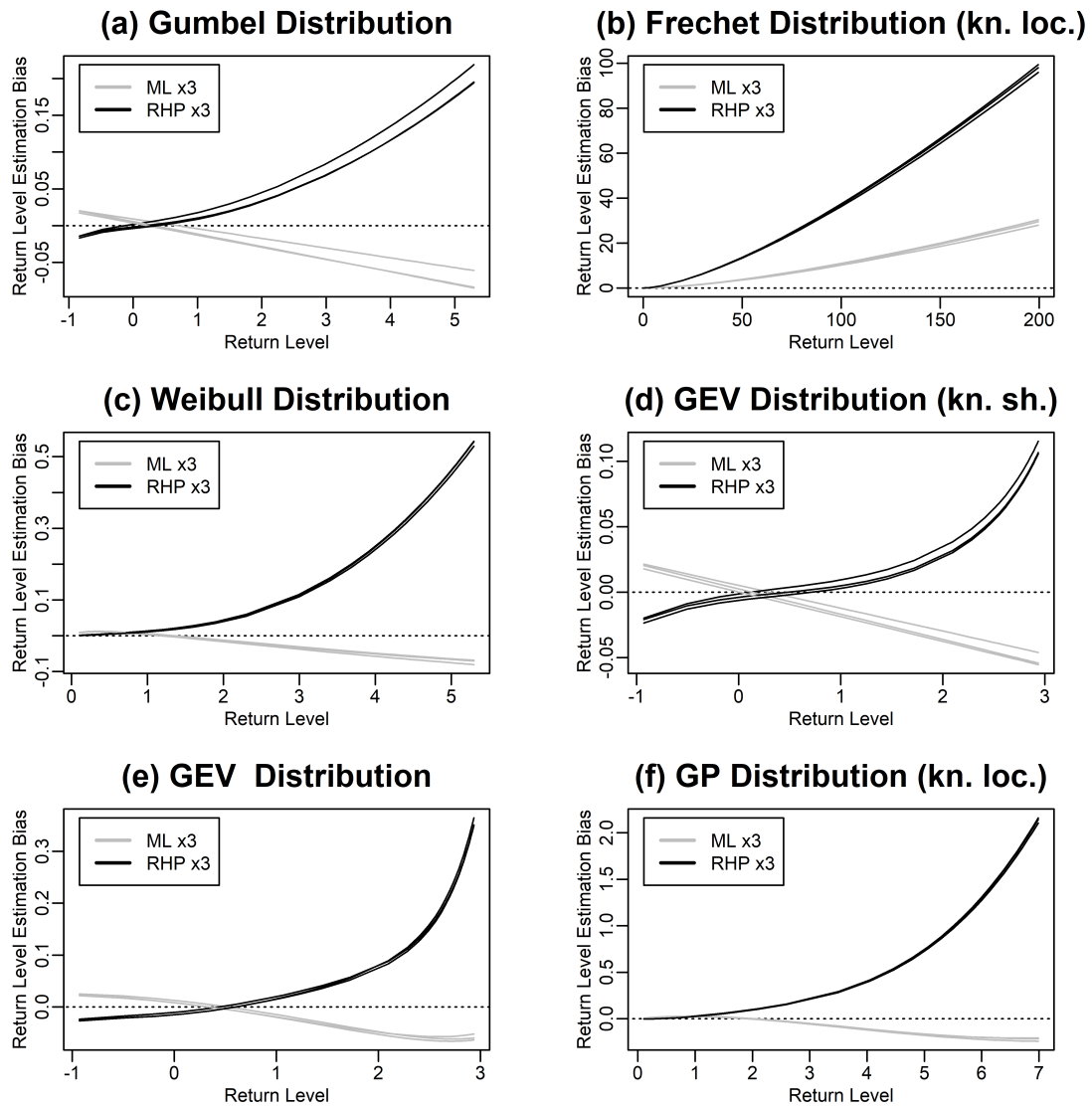
Figure S2. As supplemental material (SM) Figure S1, but for different distributions.
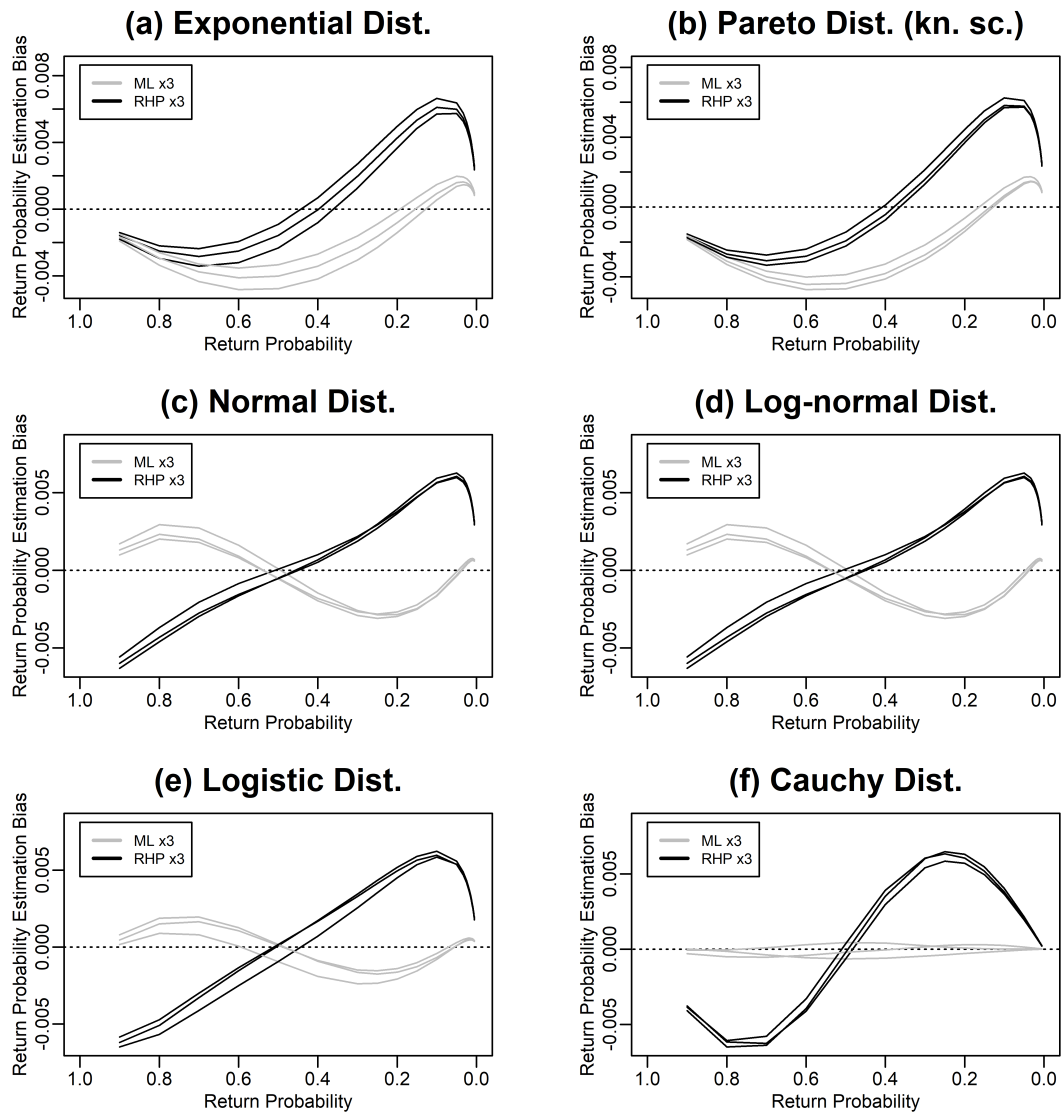
Figure S3. As SM Figure S1, but for return probability bias versus return probability.
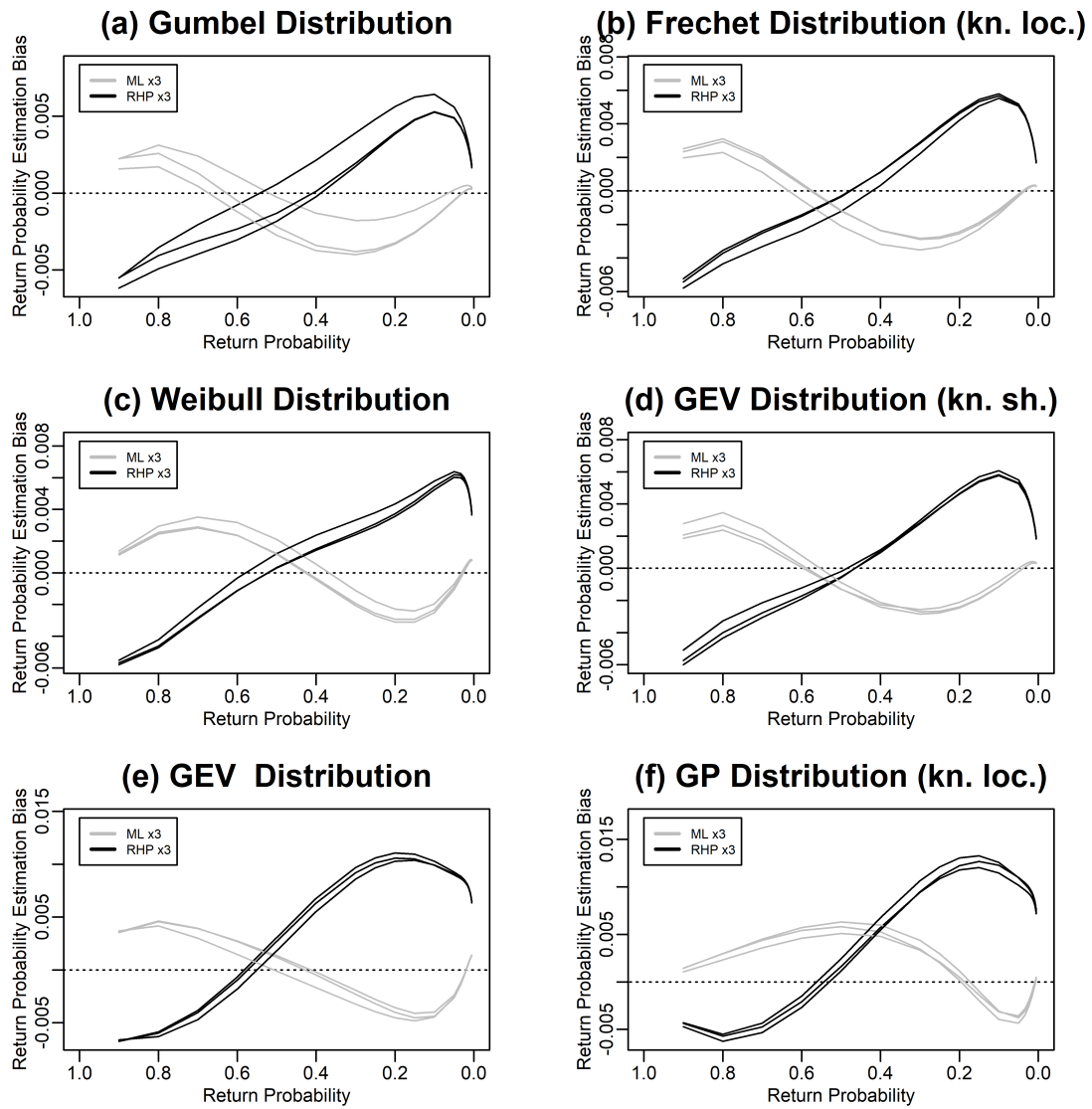
Figure S4. As SM Figure S2, but for return probability bias versus return probability.
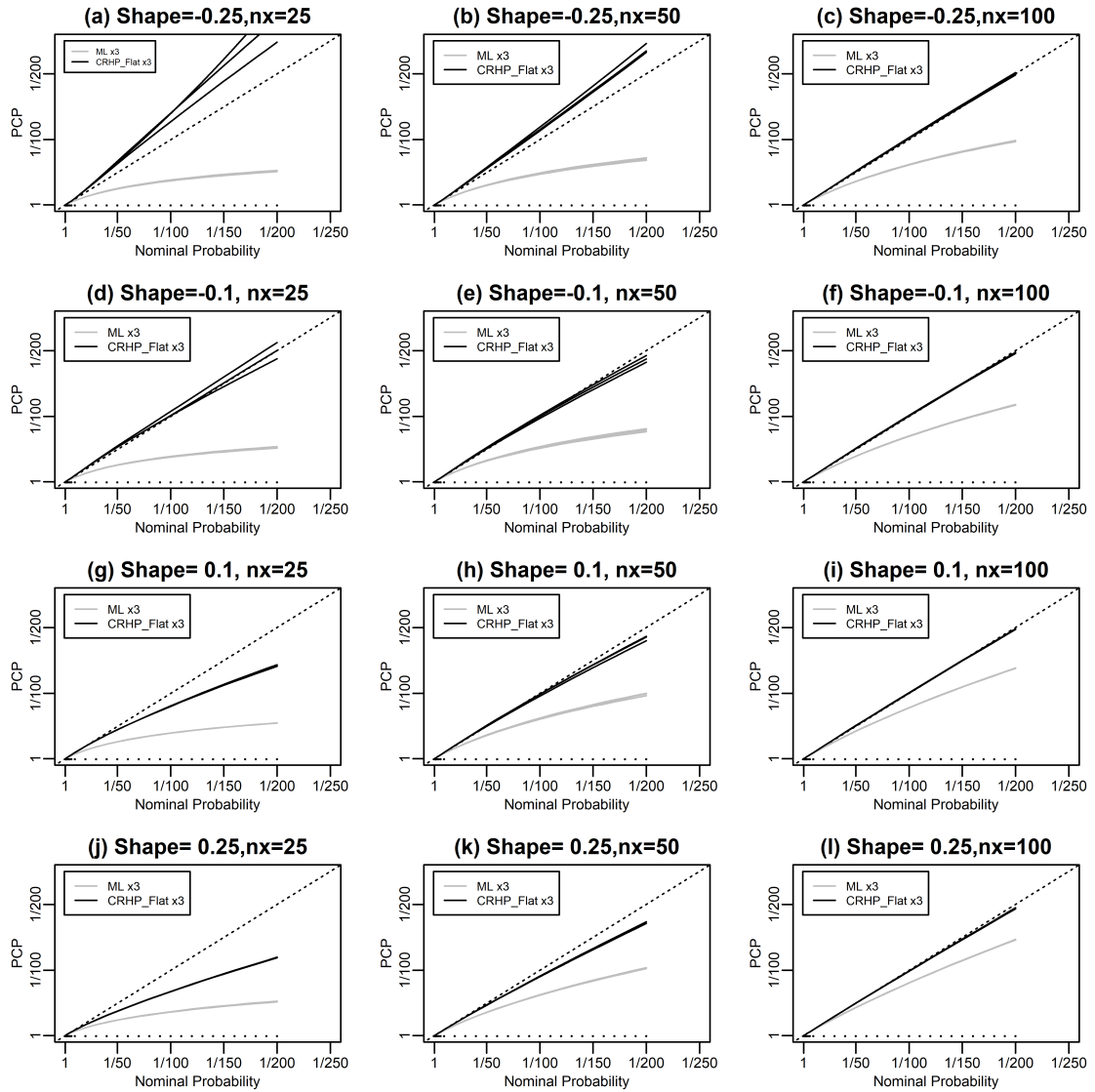
Figure S5. Evaluation of the performance of various methods for predicting data simulated from a GEVD with a predictor on the location parameter. The three rows correspond to sample sizes of 25, 50 and 100, respectively. The four columns correspond to values of the shape parameter of -0.25, -0.1, 0.1 and 0.25, respectively. Two methods are used to make the predictions: maximum likelihood and Bayesian prediction using DMGS with the RHP on the location and scale parameters and a flat prior on the shape parameter.
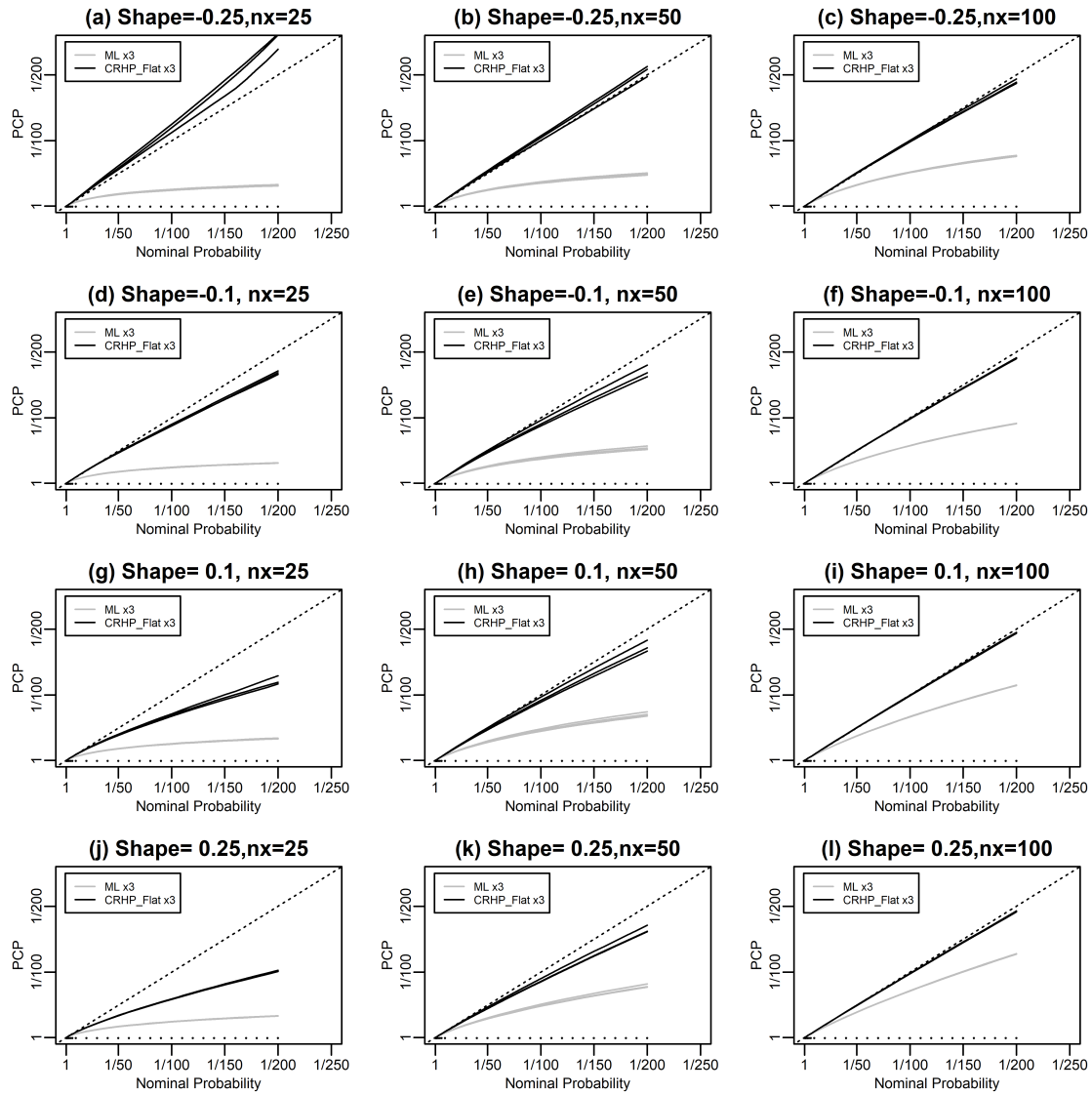
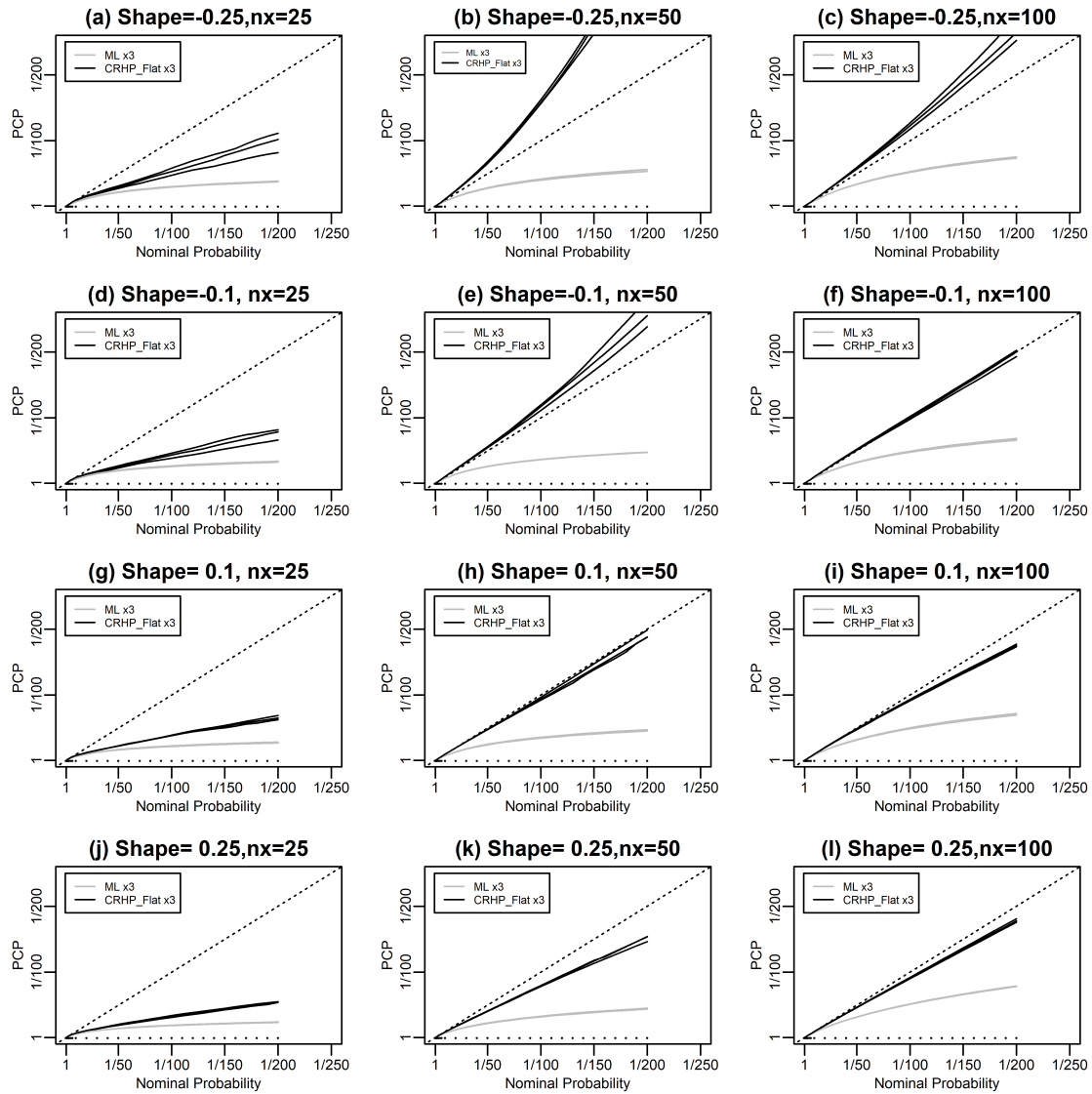**Figure S6.** As SM Figure S5, but now for the GEV with predictors on the location and scale parameters.

Figure S7. As SM Figure S5, but now for the GEV with predictors on the location, scale and shape parameters.
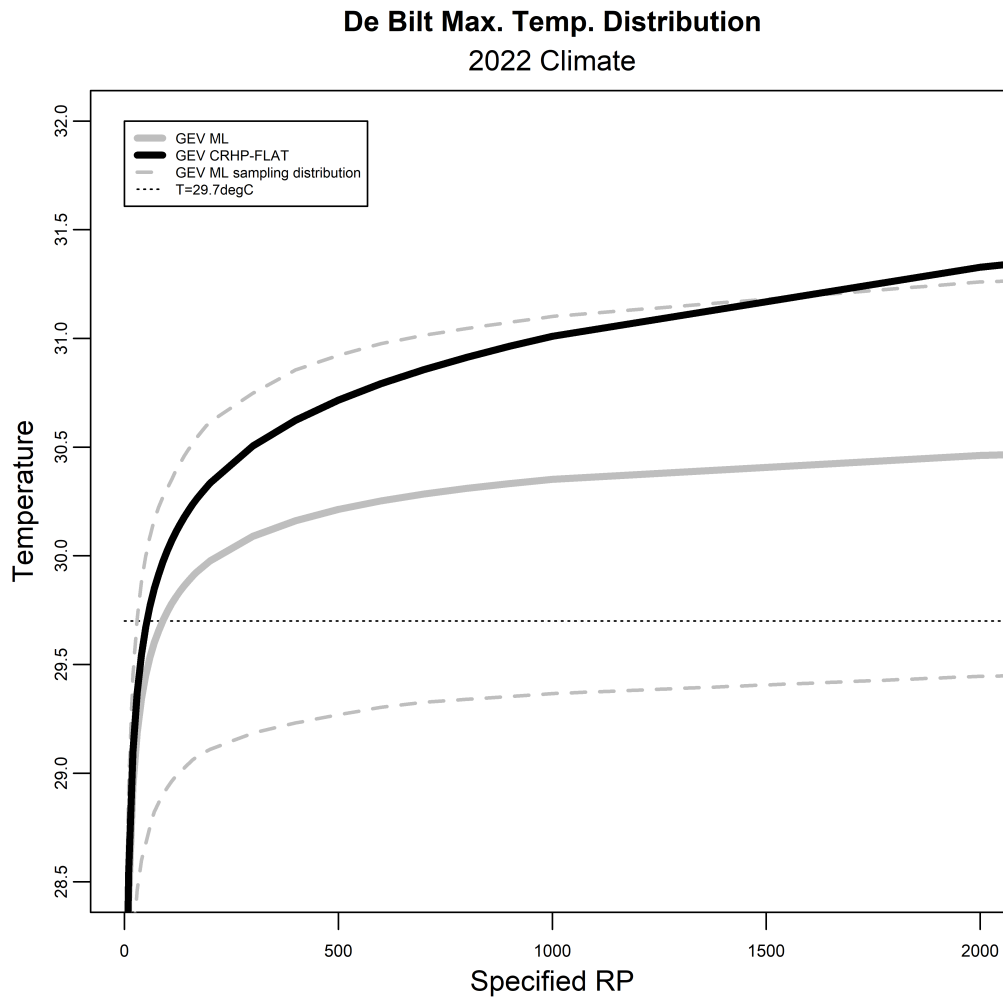
Figure S8. Return probabilities from the maximum likelihood (grey) and CRHP-flat (black) versions of the GEV1 model (as shown in the main article Figure 7), along with bootstrap-based 90% confidence intervals for the maximum likelihood model (grey dashed).
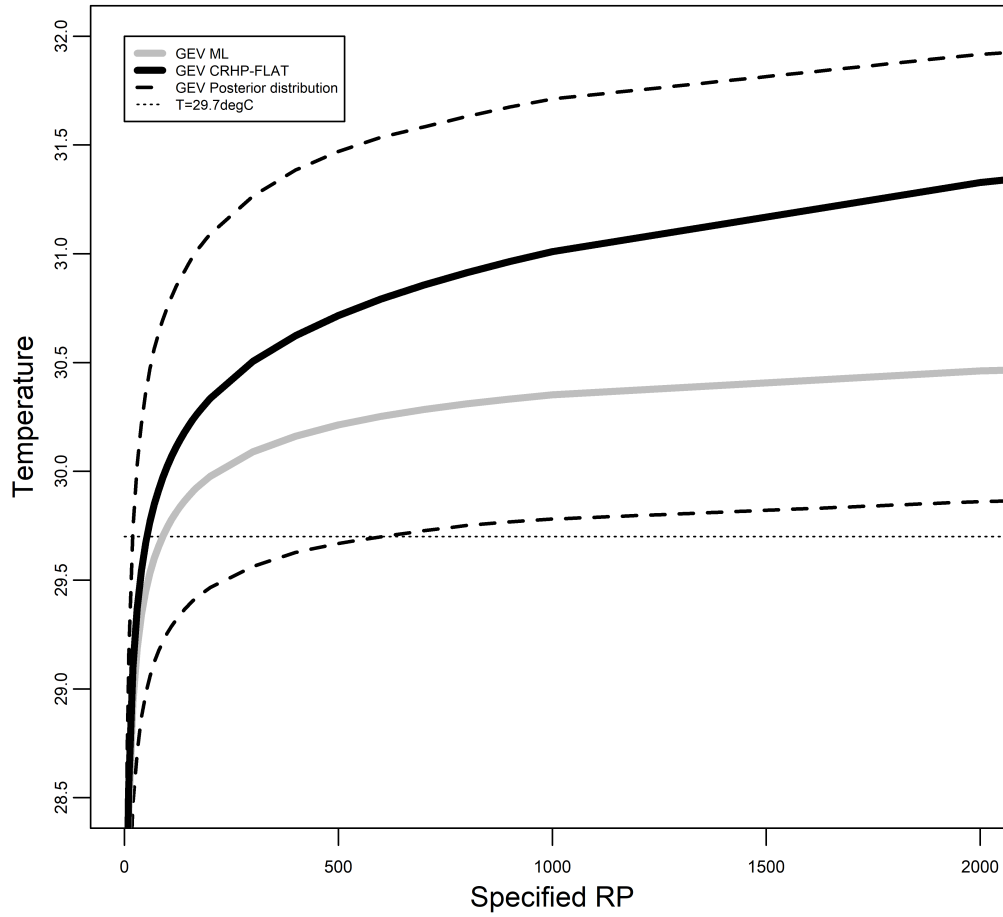
Figure S9. Return probabilities from the maximum likelihood (grey) and CRHP-flat (black) versions of the GEV1 model (as shown in the main article Figure 7), along with 5% to 95% uncertainty bands generated by sampling the parameter posterior for the CRHP-flat model (black dashed).