Natural Hazards
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Supplement of

Return levels of extreme European windstorms, their dependency on the North Atlantic Oscillation, and potential future risks

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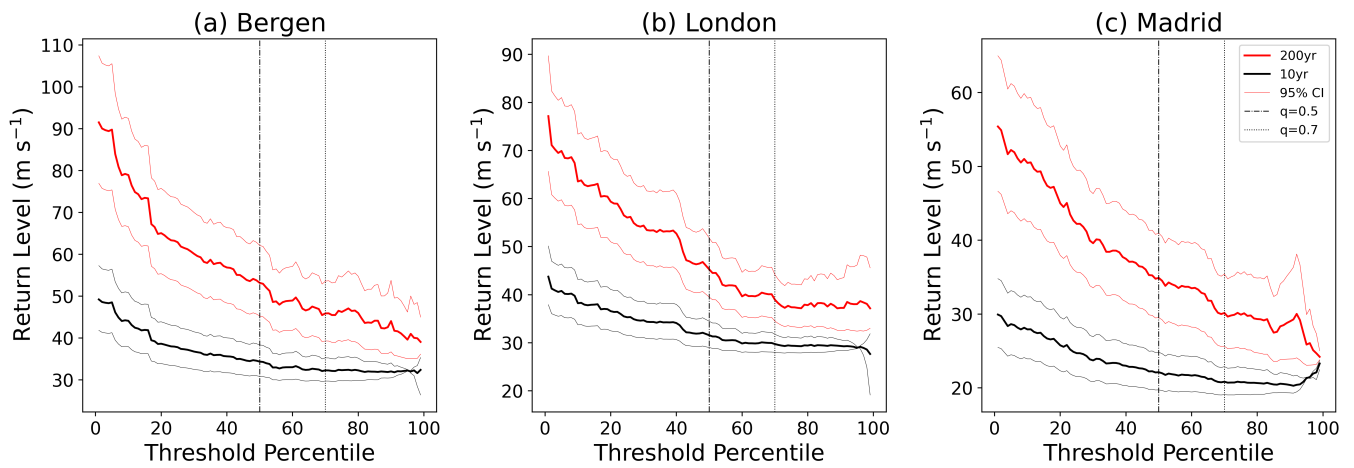*Correspondence to:* Matthew D. K. Priestley (m.priestley@exeter.ac.uk)

Figure S1. The sensitivity of the 10-year (black solid) 200-year (red solid) return level to the choice of quantile threshold for (a) Bergen, (b) London, and (c) Madrid. Vertical black lines indicate the 0.5 and 0.7 quantiles. Thin red and black lines represent the 95% confidence interval based upon the estimate of the σ parameter.
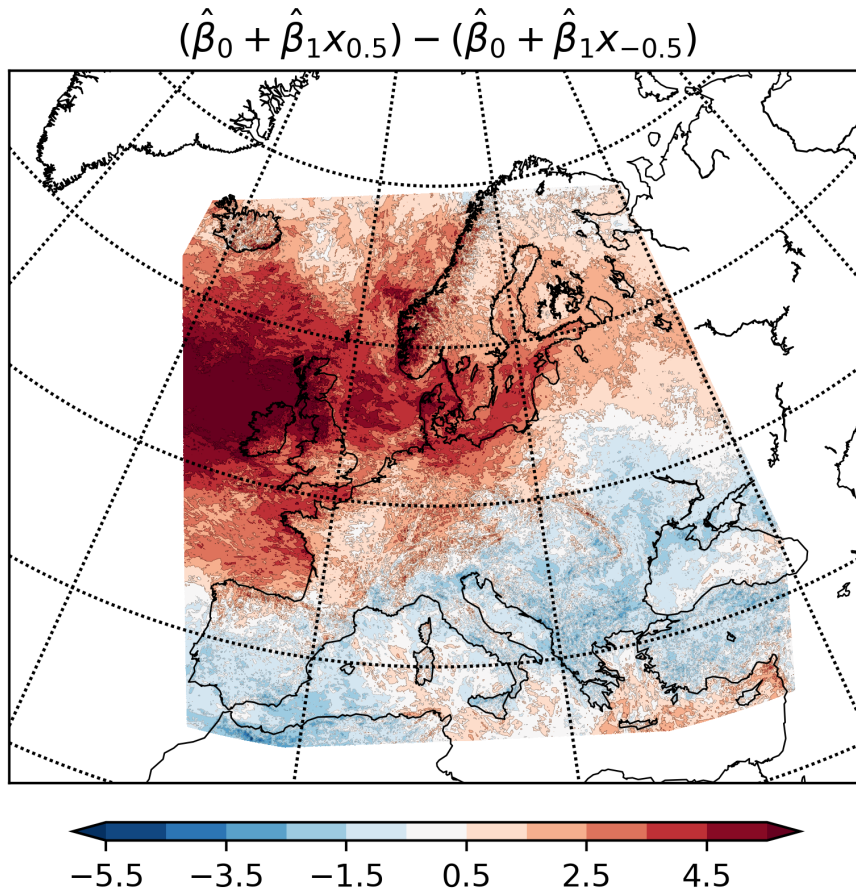
Figure S2. Difference in estimated return levels for NAO states of +0.5 and -0.5 standard deviations. Differences are shown through the difference in $\hat{\beta}_0 + \hat{\beta}_1 x$. Units are m s^{-1}.
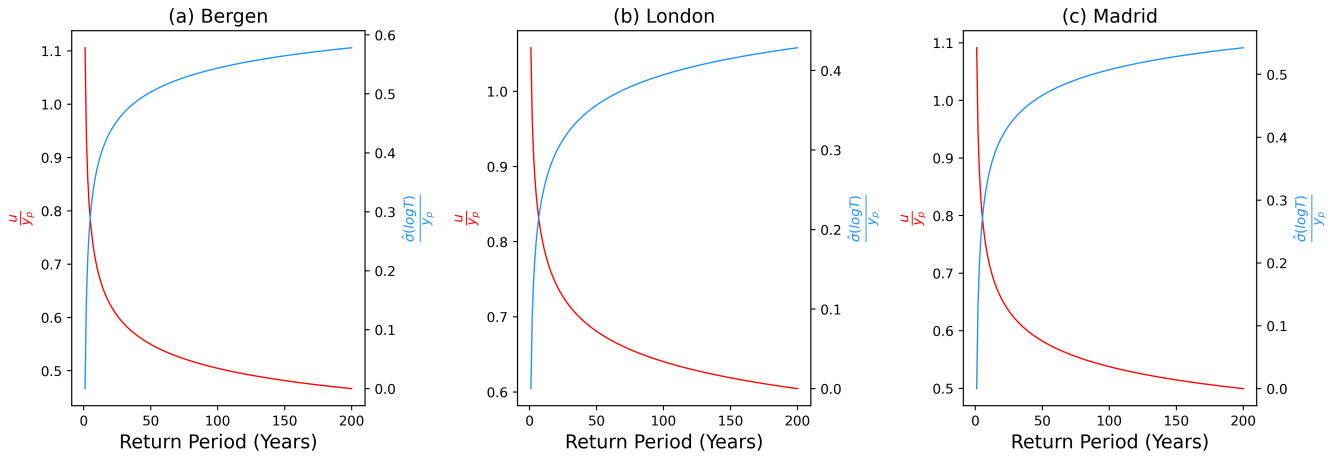
Figure S3. Ratio of the threshold (u) and excess ($\hat{\sigma}(logT)$) in the formulation of the return level for a range of return periods. Ratios are shown for (a) Bergen, (b) London, and (c) Madrid.
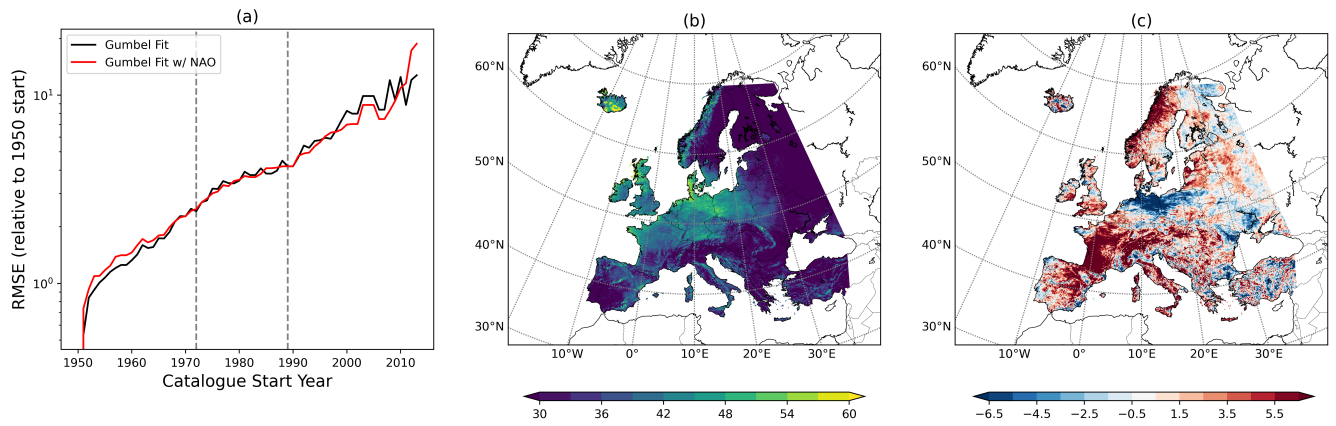
Figure S4. (a) Root mean square error of the 200-year return level estimated from different length historical catalogues, relative to a catalogue from 1950-2014. Black line is for the standard Gumbel fit, and red line is for the fit including the NAO covariate. (b) The 200-year return level for a catalogue from 1950-2014. (c) Difference in the 200-year return level for a catalogue from 1990-2014, relative to (b). Units of (b) and (c) are m s^{-1}.
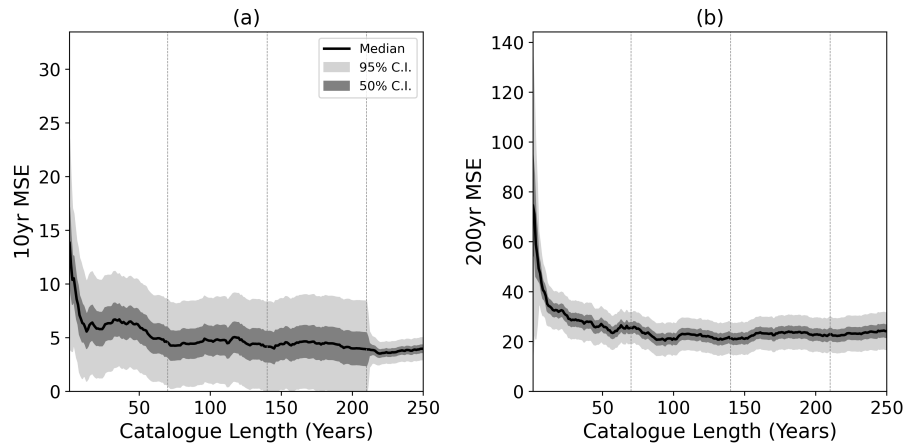
Figure S5. Mean square error the (a) 10-year and (b) 200-year return level estimation of different length historical catalogues against a subsequent 10 year period with events from a 1000-year simulation for London. Solid black line shows the median MSE from all possible periods. The dark and light gray areas represent the 50% and 95% confidence interval on the standard error respectively. Vertical dashed grey lines indicate the periodicity of the NAO used in simulations.
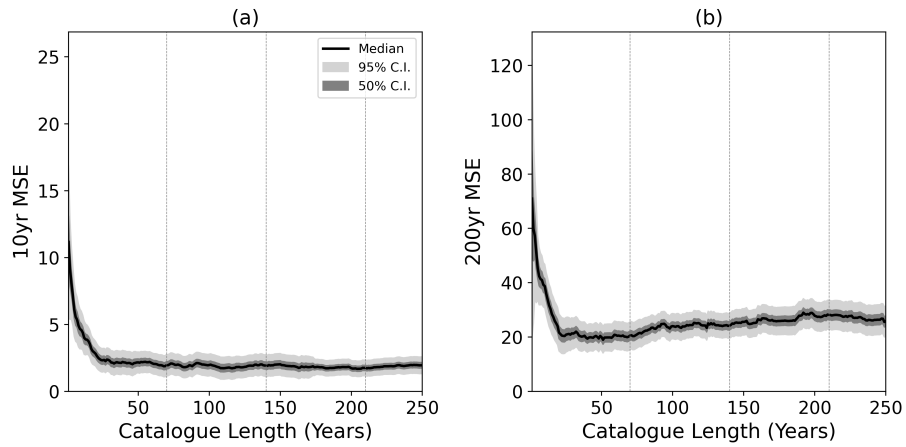
Figure S6. Mean square error the (a) 10-year and (b) 200-year return level estimation of different length historical catalogues against a subsequent 10 year period with events from a 1000-year simulation for Madrid. Solid black line shows the median MSE from all possible periods. The dark and light gray areas represent the 50% and 95% confidence interval on the standard error respectively. Vertical dashed grey lines indicate the periodicity of the NAO used in simulations.