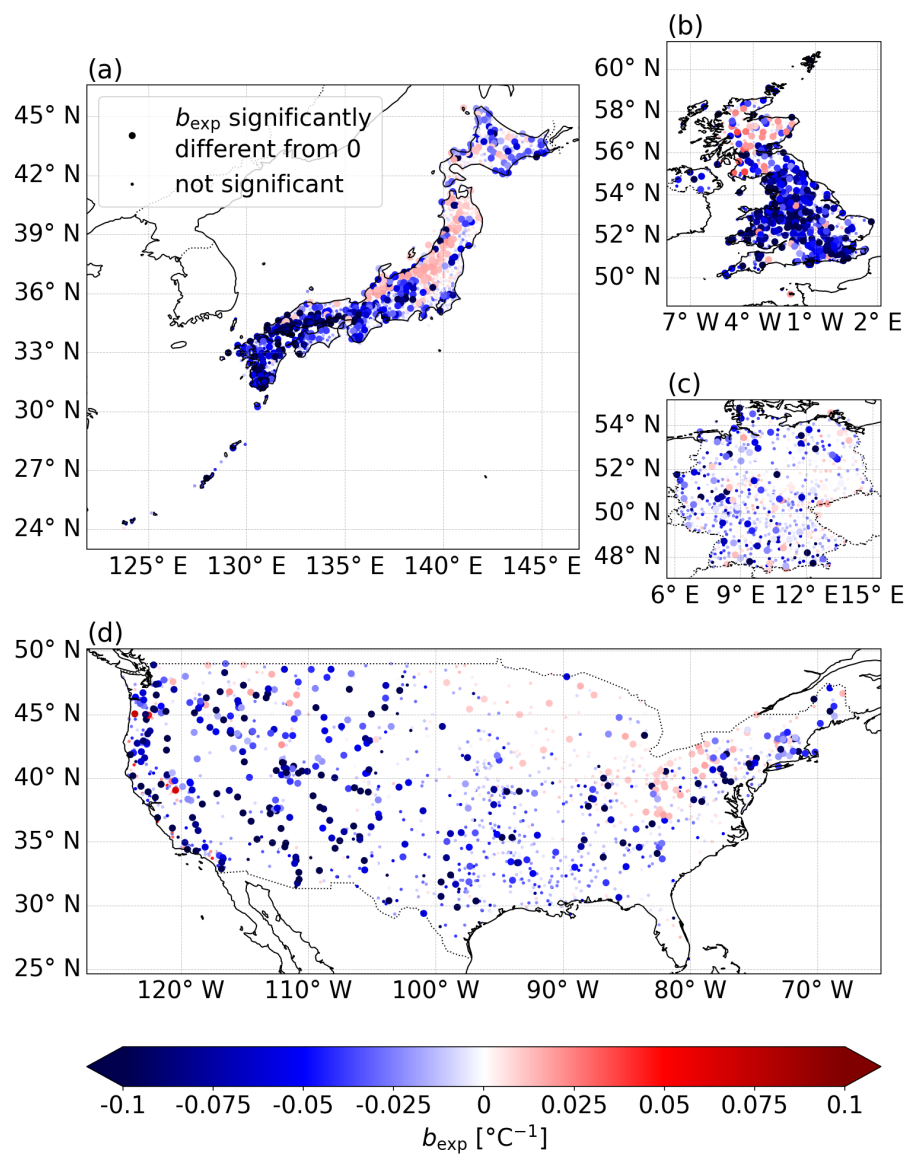# Supplementary material

Figure S1. As Figure 1, but for the case where b is fitted using an exponential dependence.
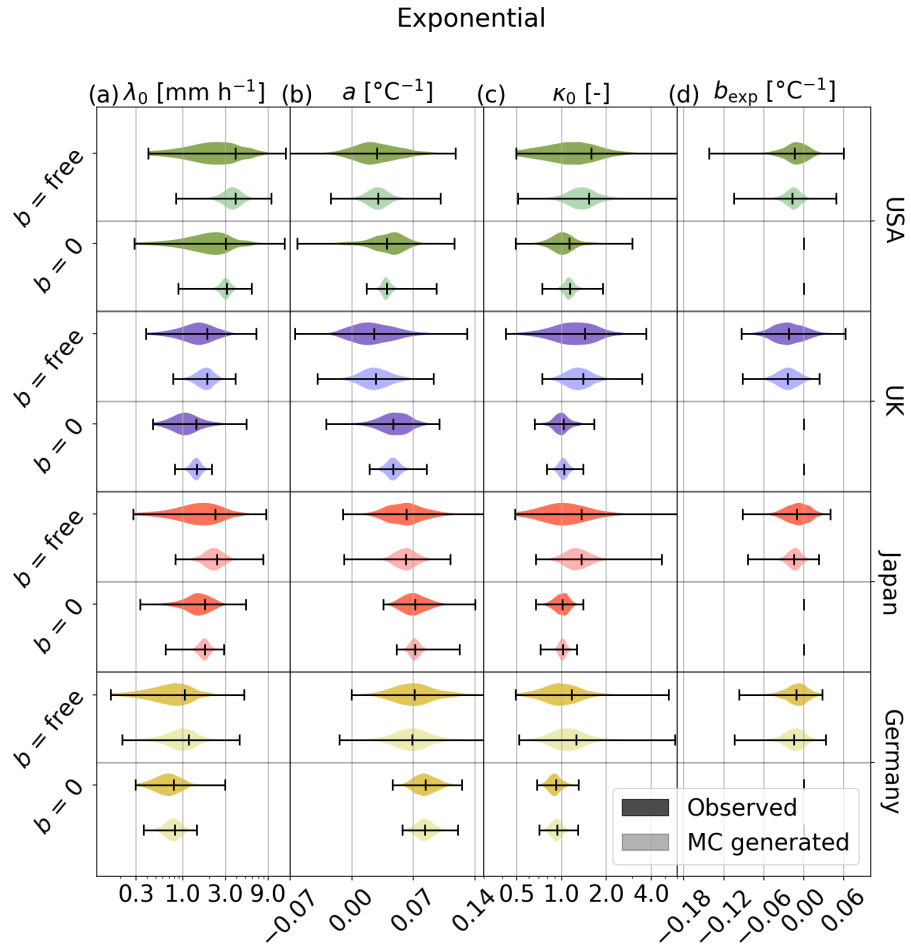
Figure S2. As Figure 2, but when b is fitted using an exponential dependence.
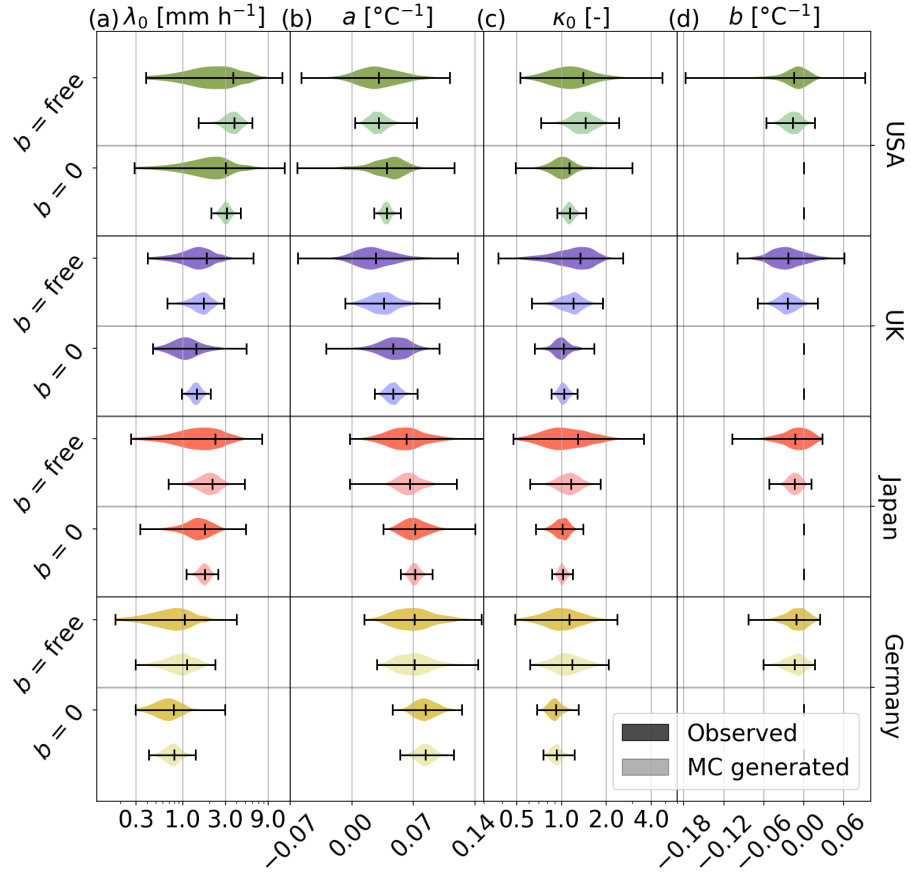
Figure S3. Distribution of parameters of the magnitude model in the USA (green), UK (blue), Japan (red), and Germany (yellow). The darker plots are the observed values, and the lighter plots are the Monte Carlo generated values. In each country, the upper two plots are the parameters when b is fitted freely, and the lower two plots are the parameters when $b = 0$. This is with the same average number of events in each simulation.
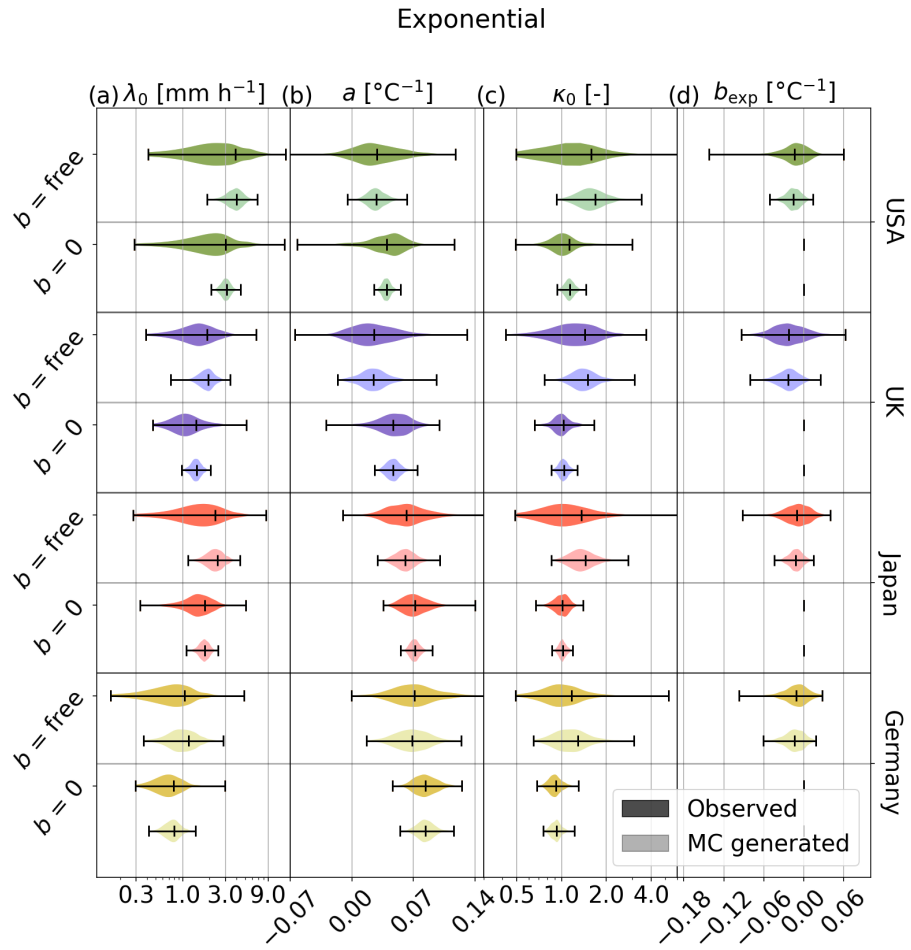
Exponential

Figure S4. As Supplementary Figure S3, but when b is fitted using an exponential dependence.

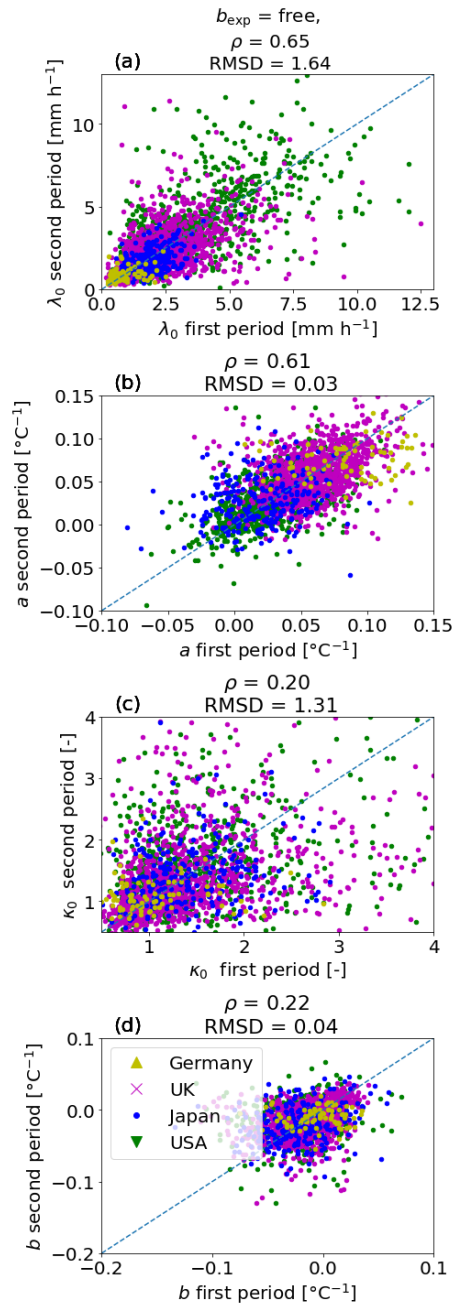**Figure S5.** As Figure 3, but when b is fitted using an exponential dependence.
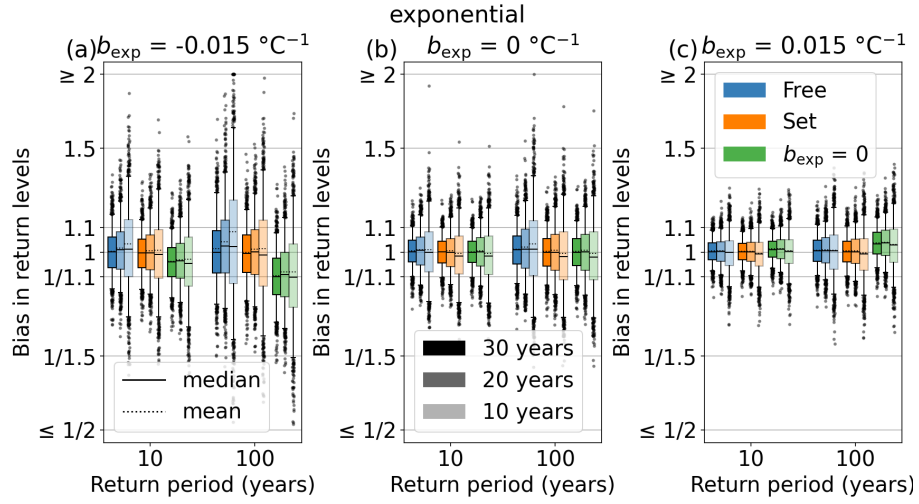
Figure S6. As Figure 5, but when b is fitted using an exponential dependence.

Table S1. The average values of the parameters in the magnitude model (λ_0, a, κ_0, b), and the temperature model (μ, σ). Also, the average number of events per station and the total number of stations in each region. These values were used to produce the Monte Carlo generated events in Figure 2.

	Japan	UK	Germany	USA
λ_0	2.29	1.84	1.05	1.39
$\lambda_0, b = 0$	1.75	1.42	0.79	3.03
a	0.062	0.027	0.071	0.031
$a, b = 0$	0.072	0.047	0.083	0.039
κ_0	1.29	1.34	1.12	1.39
$\kappa_0, b = 0$	1.01	1.03	0.92	1.13
b	-0.013	-0.024	-0.012	-0.015
μ	11.6	9.2	9.7	11.4
σ	12.9	8.5	12.9	15.2
Average number of events per station	2116	1387	989	1211
Number of stations (M)	1207	913	696	1386

Table S2. Ratios between the interquartile ranges of observed and generated parameters when using an exponential shape parameter. As Table 1 for "b = free".

Parameter	Germany	Japan	UK	US
λ_0	0.91	0.52	0.54	0.40
a	0.85	0.55	0.67	0.46
κ_0	1.01	0.53	0.59	0.60
b	0.93	0.51	0.65	0.65

Table S3. The ratio of the interquartile range of the generated parameters to the interquartile range of the observed parameters in each country. When the number of events at each station is the same, and the average.

Parameter	b = free				$b = 0$			
	Germany	Japan	UK	US	Germany	Japan	UK	US
λ_0	0.90	0.48	0.56	0.36	0.59	0.40	0.33	0.25
a	0.82	0.58	0.68	0.38	0.71	0.37	0.42	0.25
κ_0	0.84	0.41	0.54	0.58	0.79	0.52	0.59	0.42
b	0.91	0.47	0.54	0.70	-	-	-	-

Table S4. Ratios between the interquartile ranges of observed and generated parameters when using the exponential shape parameter.

Parameter	Germany	Japan	UK	US
λ_0	0.90	0.47	0.46	0.35
a	0.83	0.49	0.55	0.37
κ_0	0.99	0.55	0.60	0.64
b	0.89	0.49	0.60	0.60