Contents of supplementary material
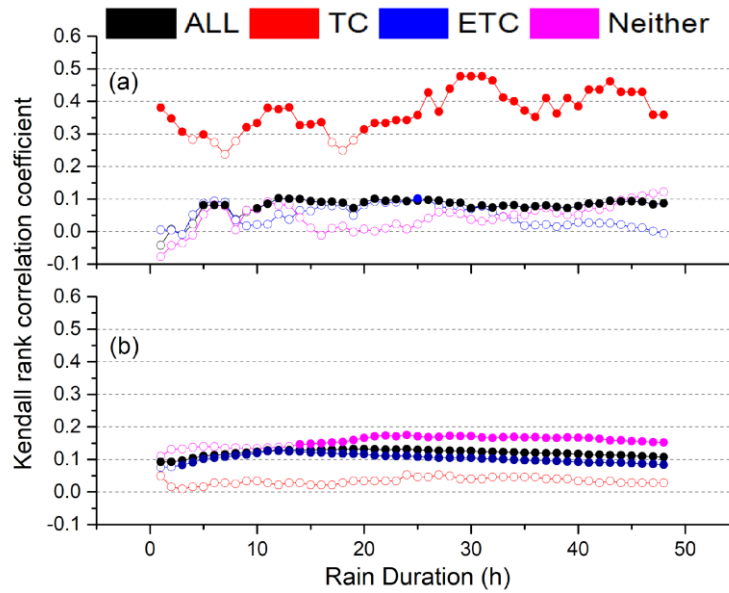
Figure S1: The Kendall rank correlation coefficient between storm-duration maximum total rainfall (1- 48 hours) and NTR for P-C compound event (a) and C-P compound event (b) associated with different storm types for the Battery. The filled circles represent statistically significant cases ($p<0.05$).
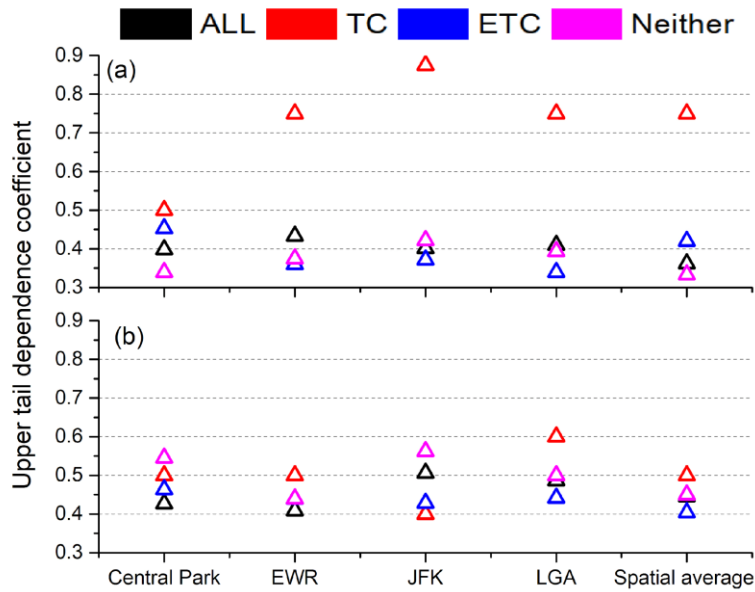
Figure S2: The upper tail dependence coefficient above a threshold of 0.6 derived from the observed events associated with different storm types for (a) P-C simultaneous compound flood drivers and (b) C-P simultaneous compound flood drivers for each single gauge and the spatial average for the Battery.
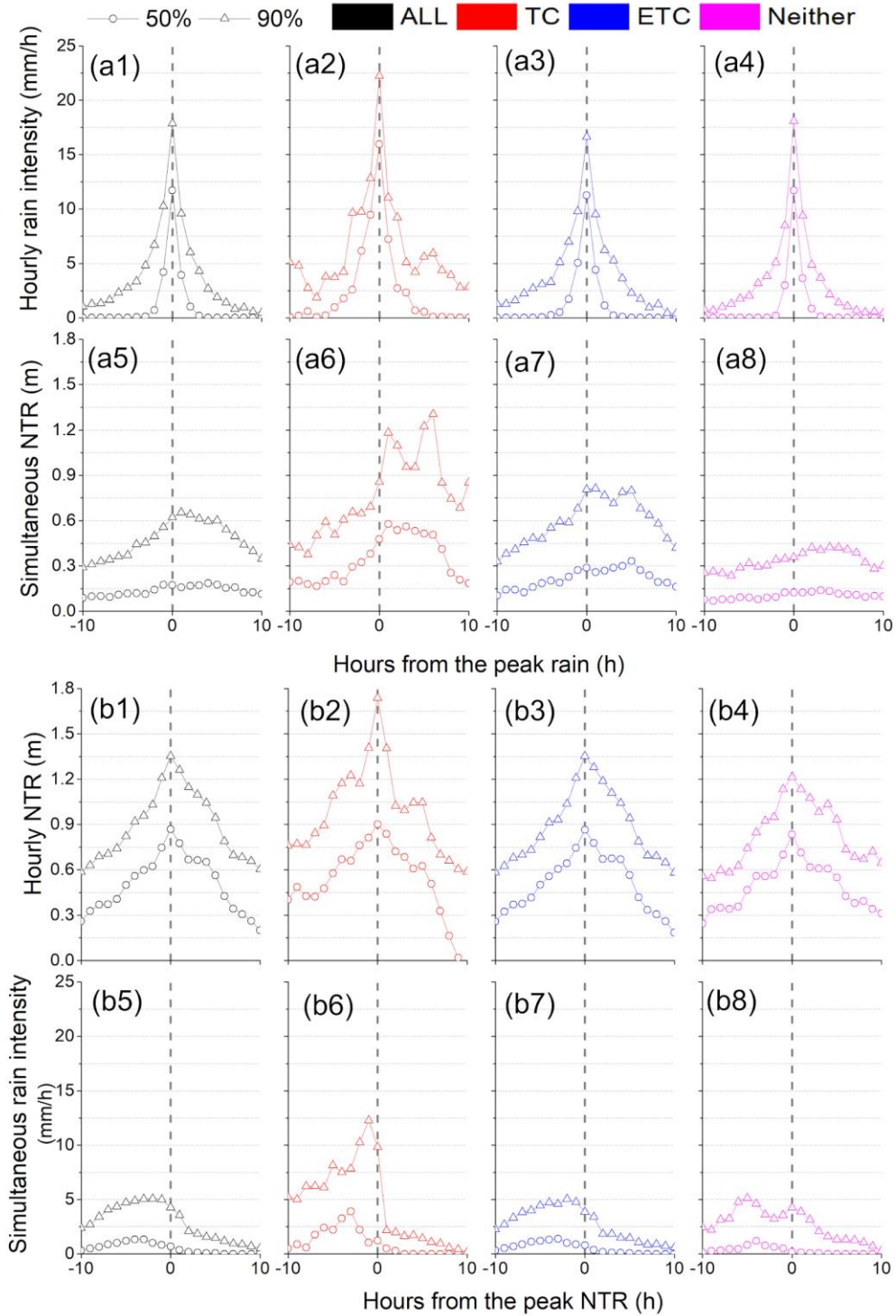
Figure S3: The magnitude of the P-C compound flood drivers (top; a1-a8) and the C-P compound flood drivers (bottom; b1-b8) by different storm types for Kings Point. The top row (a1-a4) and third row (b1-b4) show primary flood driver magnitudes (50th and 90th percentile), and the second row (a5-a8) and bottom row (b5-b8) show secondary flood driver magnitudes. The X-axis ranges from -10 to 10 h indicate time relative to the peak rain (top; a1-a8) or NTR (bottom; b1-b8).
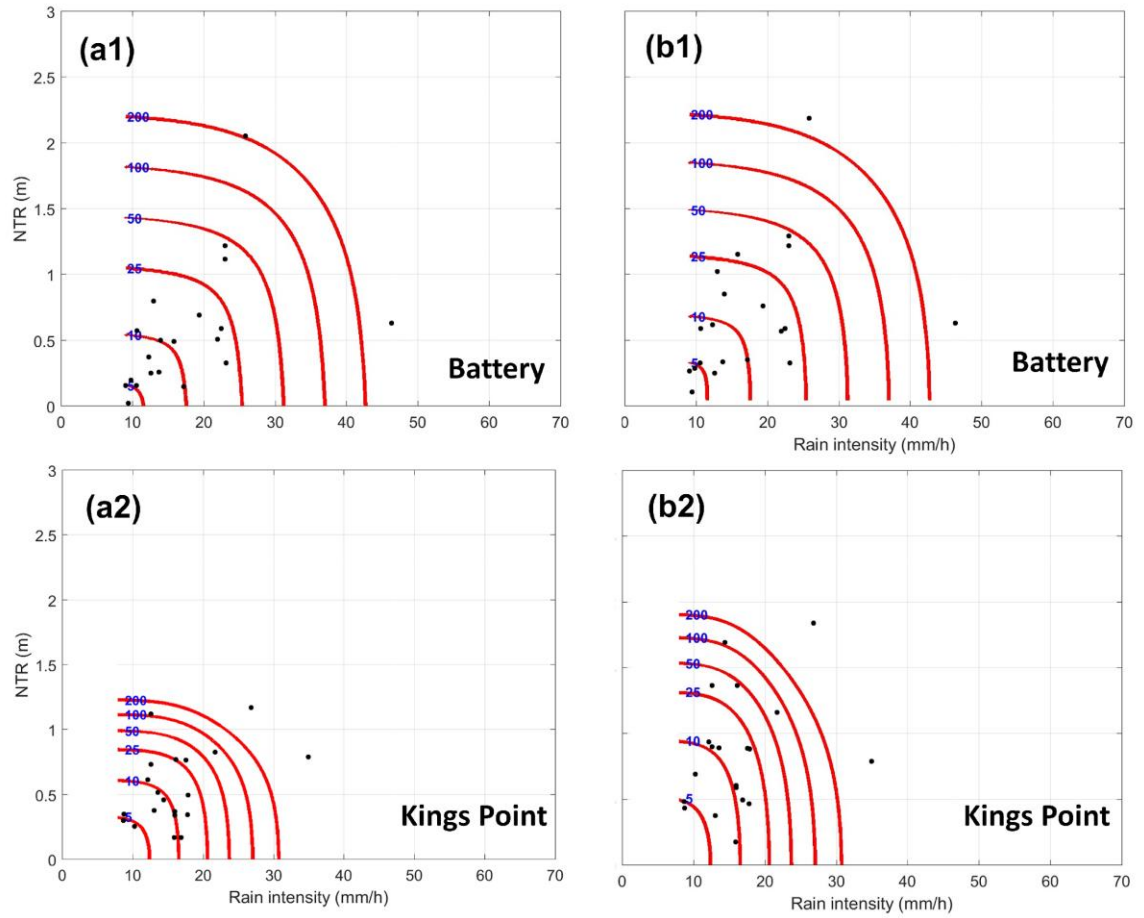
Figure S4: The joint return period curves (red lines, blue labels) for the P-C compound event associated with TC at the Battery (top) using simultaneous hourly flood drivers (a1) and storm-duration maximum flood drivers (b1). Similarly, for Kings Point (bottom). The black dot points are the observed events.

Table S1: Statistical measures for the Plackett copula (selected from 25 copulas in MvCAT).

Storm type	Scenarios	Rank of BIC	p for copulas	RMSE	NSE
TC	P-C Simultaneous	1	0.98	0.068	0.99
TC	P-C Storm maximum	8	0.35	0.12	0.98
ETC	P-C Simultaneous	3	0.99	0.083	0.99
Neither	P-C Simultaneous	3	0.35	0.13	0.99
All	P-C Simultaneous	2	0.77	0.11	0.99
TC	C-P Simultaneous	2	0.99	0.071	0.99
TC	C-P Storm maximum	6	0.26	0.13	0.98
ETC	C-P Simultaneous	3	0.48	0.12	0.99
Neither	C-P Simultaneous	7	0.77	0.10	0.99
All	C-P Simultaneous	7	0.31	0.13	0.99

Table S2: The sensitivity analysis for the dependency of P-C simultaneous compound flood drivers and C-P simultaneous compound flood drivers associated with TC and ETC regarding different thresholds and distances for storm association at the Battery.

Storm type	Storm Association distance	P-C compound event				C-P compound event			
		PYA Threshold for All (year^{-1})	PYA for TC/ETC (year^{-1})	Kendall's rank correlation coefficient	p	PYA Threshold for All (year^{-1})	PYA for TC/ETC (year^{-1})	Kendall's rank correlation coefficient	p
TC	200 km	5	0.09	0.62	0.07	5	0.16	-0.15	0.54
TC	350 km	5	0.2	0.50	0.01	5	0.32	0.03	0.84
TC	500 km	5	0.27	0.52	0.001	5	0.35	0.01	0.93
TC	500 km	3	0.2	0.40	0.04	3	0.11	-0.07	0.90
TC	500 km	4	0.22	0.34	0.06	4	0.15	-0.05	0.88
ETC	500 km	5	0.84	0.05	0.56	5	2.48	0.12	0.01
ETC	750 km	5	1.33	0.02	0.77	5	3.2	0.13	0.002
ETC	1000 km	5	1.75	0.02	0.72	5	3.50	0.11	0.008
ETC	1000 km	3	0.91	-0.03	0.68	3	1.68	0.09	0.15
ETC	1000 km	4	1.31	-0.02	0.73	4	2.12	0.14	0.006