Supplementary Material :

Spatial Dependence Analysis of Weekly Moving Cumulative Rainfall Data for Flood Risk Assessment

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1. The code of station, station name, provincial area

Table S 1 Station ID, station name, provincial area, latitude, and longitude for each station.

Station ID	Station Name	Province	Latitude	Longitude
ST1	Loei	Loei	$17°45'$	$101°73'$
ST2	Loei Agromet*	Loei	$17°40'$	$101°73'$
ST3	Udon Thani	Udon Thani	$17°38'$	$102°80'$
ST4	Nong Bua Lamphu	Nong Bua Lamphu	$16°24'$	$101°94'$
ST5	Khon Kaen	Khon Kaen	$17°25'$	$102°98'$
ST6	Tha Phra Agromet*	Khon Kaen	$16°33'$	$102°82'$
ST7	Mukdahan	Mukdahan	$16°53'$	$104°72'$
ST8	Maha Sarakham	Maha Sarakham	$17°07'$	$103°15'$
ST9	Kalasin	Kalasin	$16°24'$	$102°78'$
ST10	Chaiyaphum	Chaiyaphum	$15°80'$	$102°03'$
ST11	Roi Et	Roi Et	$16°05'$	$103°68'$
ST12	Roi Et Agromet*	Roi Et	$16°07'$	$103°62'$
ST13	Ubon Ratchathani Agromet*	Ubon Ratchathani	$15°93'$	$105°60'$
ST14	Ubon Ratchathani	Ubon Ratchathani	$15°25'$	$104°87'$
ST15	Sisaket	Sisaket	$15°03'$	$104°25'$
ST16	Nakhon Ratchasima	Nakhon Ratchasima	$15°72'$	$102°67'$
ST17	Pak Chong Agromet*	Nakhon Ratchasima	$15°27'$	$101°57'$
ST18	Chok Chai	Nakhon Ratchasima	$14°85'$	$102°28'$

* *is Sub-station of the Meteorological Department for agriculture.*

2. Descriptive statistics of each station

Table S 2 Station ID, descriptive statistics of weekly moving cumulative rainfall data (unit: mm.) in the Chi watershed of Thailand. Q_1 and Q_3 is 25^{th} and 75^{th} percentile, respectively.

Station ID	Season	Min	Q_1	Median	Q_3	Max	IQR
ST1	Winter	0.020	1.800	8.200	21.700	124.500	19.900
	Rainy	0.100	8.050	18.650	34.075	164.100	26.025
	Summer	0.020	3.025	9.450	24.225	96.000	21.200
ST2	Winter	0.020	1.500	7.200	20.850	128.300	19.350
	Rainy	0.100	7.700	17.550	33.525	164.400	25.825
	Summer	0.020	3.600	11.500	24.550	114.400	20.950
ST3	Winter	0.020	0.800	6.250	19.275	144.700	18.475
	Rainy	0.020	12.800	23.700	41.800	274.500	29.000
	Summer	0.020	2.175	9.150	23.950	158.300	21.775
ST4	Winter	0.010	1.625	7.200	18.750	177.800	17.125
	Rainy	0.400	12.000	20.800	38.425	180.300	26.425
	Summer	0.020	3.275	9.450	25.450	94.000	22.175
ST5	Winter	0.010	1.175	6.350	22.875	99.200	21.700
	Rainy	0.100	8.300	20.300	37.450	196.300	29.150
	Summer	0.020	2.825	9.850	26.900	221.900	24.075
ST6	Winter	0.020	1.300	7.300	23.100	141.400	21.800
	Rainy	0.020	8.350	19.200	36.200	200.400	27.850
	Summer	0.020	2.975	9.950	27.100	164.200	24.125
ST7	Winter	0.010	1.100	4.950	17.375	96.400	16.275
	Rainy	0.001	12.100	26.700	48.400	269.400	36.300
	Summer	0.100	2.600	10.550	25.725	134.500	23.125
ST8	Winter	0.010	2.400	7.150	21.100	149.500	18.700
	Rainy	0.020	10.600	22.200	39.700	183.700	29.100
	Summer	0.020	2.975	11.350	25.900	177.000	22.925
ST9	Winter	0.001	0.875	8.800	25.525	114.300	24.650
	Rainy	0.020	8.250	21.000	38.800	157.100	30.550
	Summer	0.020	2.400	9.400	22.900	134.900	20.500

Table S 3 Station ID, descriptive statistics of weekly moving cumulative rainfall data (unit: mm.) in the Chi watershed of Thailand. Q_1 and Q_3 is 25^{th} and 75^{th} percentile, respectively (Cont.).

Station ID	Season	Min	Q_1	Median	Q_3	Max	IQR
ST10	Winter	0.020	1.600	8.300	27.200	88.400	25.600
	Rainy	0.020	6.550	17.000	33.950	148.300	27.400
	Summer	0.020	3.500	10.600	27.900	162.500	24.400
ST11	Winter	0.001	1.300	6.000	22.400	92.700	21.100
	Rainy	0.020	10.800	22.900	41.000	198.600	30.200
	Summer	0.100	3.550	11.400	25.100	109.300	21.550
ST12	Winter	0.020	1.400	6.300	23.000	107.000	21.600
	Rainy	0.020	9.700	21.900	42.475	201.300	32.775
	Summer	0.020	2.800	11.000	26.100	118.400	23.300
ST13	Winter	0.020	0.950	7.100	24.200	160.800	23.250
	Rainy	0.100	12.500	26.700	45.900	254.300	33.400
	Summer	0.020	1.900	9.400	23.200	135.400	21.300
ST14	Winter	0.010	1.100	6.800	23.100	172.600	22.000
	Rainy	0.020	13.500	27.600	45.300	190.000	31.800
	Summer	0.020	1.775	10.650	28.050	116.700	26.275
ST15	Winter	0.020	1.500	8.550	28.425	118.600	26.925
	Rainy	0.020	12.100	25.000	45.200	263.400	33.100
	Summer	0.020	2.600	9.000	22.900	127.500	20.300
ST16	Winter	0.001	1.100	6.700	23.625	141.500	22.525
	Rainy	0.020	5.625	15.850	31.675	152.800	26.050
	Summer	0.020	2.525	9.400	24.425	107.300	21.900
ST17	Winter	0.010	2.400	8.800	21.800	145.900	19.400
	Rainy	0.020	5.950	13.500	25.450	112.700	19.500
	Summer	0.020	5.900	14.450	29.300	80.400	23.400
ST18	Winter	0.010	1.550	9.700	21.700	122.800	20.150
	Rainy	0.020	6.100	14.600	30.400	116.200	24.300
	Summer	0.020	2.350	8.900	23.225	147.500	20.875

3. Marginal Probability Distribution

Table S 4 Bivariate Generalized Extreme Value (BGEV) Copula models.

BGEV Model	Model function	parameter
Bivariate logistic (Log) [4]	$G(x_1, x_2) = exp\{-(y_1^{(\frac{1}{r})} + y_2^{(\frac{1}{r})})^r\}$	r, when $0 < r < 1$
Bivariate asymmetric logistic (Alog) [8]	$G(x_1, x_2) = exp\{-(1-t_1)y_1 - (1-t_2)y_2$ $-[(t_1y_1)^{(\frac{1}{r})} + (t_2y_2)^{(\frac{1}{r})}]^r\}$	r, t_1, t_2, when $0 < r < 1$, $0 \leq t_1, t_2 \leq 1$
Husler-Reiss (HR) [5]	$G(x_1, x_1) = exp\{-y_1\Phi(r^{-1} + r[log(y_1/y_2)]/2)$ $-y_2\Phi(r^{-1} + r[log(y_2/y_1)]/2)\}$ $\Phi(\cdot)$ is the standard normal distribution function	r, when $r > 0$,
Bivariate negative logistic (Neglog) [3]	$G(x_1, x_2) = exp\{-y_1 - y_2 + [y_1^{-r} + y_2^{-r}]^{-\frac{1}{r}}\}$	r, when $r > 0$
Bivariate asymmetric negative logistic (Aneglog) [6]	$G(x_1, x_2) = exp\{-y_1 - y_2 + [(t_1y_1)^{-r}$ $+(t_2y_2)^{-r}]^{-\frac{1}{r}}\}$	r, t_1, t_2, when $r > 0$, $0 < t_1, t_2 \leq 1$
Bilogistic (Bilog) [7]	$G(x_1, x_2) = exp\{-y_1q^{(1-\alpha)} - y_2(1-q)^{(1-\beta)}\}$, when $q = q(y_1, y_2; \alpha, \beta)$ is the root of the equation	α, β, when $0 < \alpha$, $\beta < 1$
Negative bilogistic (Negbilog) [2]	$G(x_1, x_2) = exp\{-y_1 - y_2 + y_1q^{(1+\alpha)}$ $-y_2(1-q)^{(1+\beta)}\}$ when $q = q(y_1, y_2; \alpha, \beta)$ is the root of the equation	α, β, when $\alpha > 0$, $\beta > 0$
Coles-Tawn (CT) [1]	$G(x_1, x_2) = exp\{-y_i[1 - Be(q; \alpha+1, \beta)]$ $-y_2[1 - Be(q; \alpha, \beta+1)]\}$ when $Be(q; \alpha, \beta)$ is beta distribution function and $q = \alpha y_2/(\alpha y_2 + \beta y_1)$	$\alpha > 0, \beta > 0$
Asymmetric mixed (Amix) [8]	$G(x_1, x_2) = exp\{-(y_1 + y_2)A[y_1/(y_1 + y_2)]\}$ when $A(t) = 1 - (\alpha+\beta)t + \alpha t^2 + \beta t^3$	α, β

Table S 5 The estimated parameters with standard error (S.E.) in the parenthesis obtained from the local GEV distribution.

Station ID	Parameters estimated			p-value of	p-value of
	$\hat{\mu}$(S.E)	$\hat{\sigma}$(S.E)	$\hat{\xi}$(S.E)	K-S test	AD-test
ST1	75.5746	25.5525	-0.1006	0.9990	0.9995
	(5.0573)	(3.5681)	(0.1250)		
ST2	68.5938	17.4737	0.2978	0.9423	0.9766
	(3.6509)	(3.0934)	(0.1865)		
ST3	74.7970	21.4082	0.2370	0.6022	0.8051
	(4.2675)	(3.4333)	(0.1403)		
ST5	67.3990	15.3984	0.3794	0.7857	0.9035
	(3.3974)	(3.0158)	(0.2304)		
ST6	73.2417	25.5539	0.0622	0.9980	0.9984
	(5.1869)	(3.8961	(0.1500)		
ST7	88.0520	15.8494	0.0544	0.7239	0.8712
	(3.1801)	(2.3610)	(0.1414)		
ST8	79.6809	23.4542	0.0824	0.9091	0.9726
	(4.7731)	(3.6167)	(0.1539)		
ST10	69.8512	22.0165	-0.0780	0.7046	0.6693
	(4.2727)	(2.9297)	(0.1045)		
ST11	79.8083	24.0326	0.1274	0.8621	0.9369
	(4.8303)	(3.6973)	(0.1455)		
ST12	84.1249	24.7573	0.0863	0.7437	0.8171
	(4.9039)	(3.6367)	(0.1274)		
ST13	82.5130	18.8210	0.2573	0.9840	0.9875
	(3.9918)	(3.3238)	(0.1961)		
ST14	99.9981	26.5540	-0.2233	0.9978	0.9990
	(5.2999)	(3.8144)	(0.1377)		
ST15	88.2148	21.3305	0.3286	0.9816	0.9546
	(4.6011)	(3.9670)	(0.2104)		
ST16	62.2648	14.3250	0.3351	0.8785	0.9437
	(3.0145)	(2.6126)	(0.1950)		
ST17	60.0285	19.7394	-0.4334	0.9583	0.9835
	(3.8512)	(2.8925)	(0.1270)		
ST18	60.2175	13.6117	0.0453	0.7911	0.8941
	(2.7763)	(2.0792)	(0.1568)		

4. Kendall's Tau correlation coefficient between variables at 14 stations in the Chi watershed

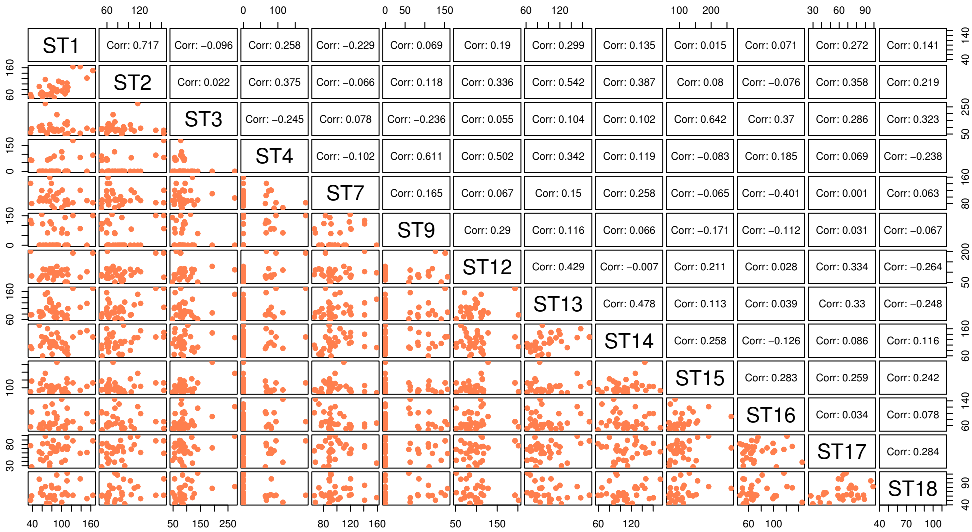


Figure S 1 The correlation coefficient between the AMWMCR data at 14 stations in the rainy season.

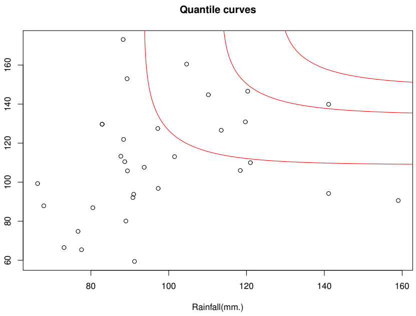
5. The Bivariate Generalized Extreme Value Copula Function Fitting

Table S 6 The best copula of BGEV models for each stations.

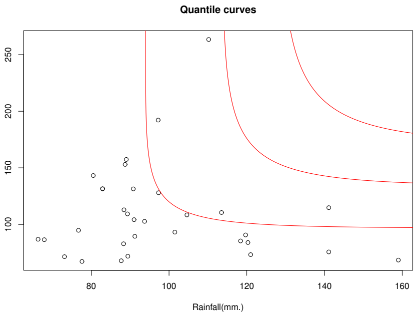
Station ID		τ	Copula function	AIC	BIC
ST1	ST2	0.4516	HR	592.2669	602.5271
	ST3	-0.0585	Neglog	624.4946	634.7547
	ST7	-0.1374	Neglog	598.8161	609.0763
	ST12	0.1253	Amix	625.3961	635.7103
	ST13	0.0343	Bilog	613.7017	624.6972
	ST14	0.0020	Bilog	620.3763	631.3401
	ST15	0.0303	Bilog	626.9858	637.6750
	ST16	0.1253	HR	602.1177	612.3779
	ST17	0.1796	Log	593.5847	603.8449
	ST18	0.1212	HR	588.4411	598.7013
ST2	ST3	-0.0303	Bilog	614.6293	624.9086
	ST7	-0.0444	Neglog	588.9781	599.2382
	ST12	0.0768	Alog	611.7820	624.9737
	ST13	0.2644	Aneglog	598.2194	608.8195
	ST14	0.2644	Bilog	605.7821	617.5080
	ST15	0.0182	HR	617.4754	627.7355
	ST16	-0.0283	Aneglog	592.4943	602.7545
	ST17	0.1837	HR	579.9361	590.1962
	ST18	0.2222	HR	577.0809	587.3410
ST3	ST7	0.0243	HR	599.5960	609.8561
	ST12	0.1132	Log	629.0429	639.3030
	ST13	-0.0545	Aneglog	617.3901	628.0586
	ST14	-0.0141	HR	622.6576	632.9178
	ST15	0.2162	Negbilog	618.6545	628.9335
	ST16	0.2224	Bilog	596.3879	608.1138
	ST17	0.0263	Bilog	588.9147	600.6406
	ST18	0.2103	HR	585.9067	596.1669
ST7	ST12	-0.0668	Neglog	603.3468	613.6069
	ST13	0.1173	HR	591.0313	601.2914
	ST14	0.2063	Log	594.4840	604.7441
	ST15	-0.0485	Bilog	602.3518	612.9302
	ST16	-0.2530	Neglog	577.5551	587.8152
	ST17	0.0485	HR	570.2953	580.5554
	ST18	0.0911	Log	563.9659	574.2260

Table S 7 The best copula of BGEV models for each stations (Cont.)

Station ID		τ	Copula function	AIC	BIC
ST12	ST13	0.1820	Alog	612.6844	625.3945
	ST14	-0.0283	Neglog	626.5518	636.8119
	ST15	0.1294	HR	630.9662	641.2263
	ST16	0.1437	HR	606.9151	617.1752
	ST17	0.2063	Bilog	595.7195	606.6801
	ST18	-0.1235	Neglog	593.5595	603.8197
ST13	ST14	0.3778	HR	607.2167	617.4769
	ST15	0.0343	Aneglog	619.8255	630.7941
	ST16	0.0162	Bilog	595.6928	605.9961
	ST17	0.1677	HR	583.8161	594.2904
	ST18	-0.1901	Neglog	582.3480	592.6081
ST14	ST15	0.1556	Neglog	623.6716	633.9318
	ST16	-0.0890	Neglog	600.6008	610.8609
	ST17	0.0465	Neglog	593.3240	603.5841
	ST18	0.0647	Log	586.0465	596.3067
ST15	ST16	0.2831	Bilog	599.5853	611.3112
	ST17	0.2040	Bilog	589.2606	600.9864
	ST18	0.1658	Bilog	589.7736	600.6219
ST16	ST17	0.0809	Bilog	571.2501	582.9760
	ST18	0.0223	Log	567.2195	577.4797
ST17	ST18	0.1658	Bilog	557.5417	568.3818



(a) ST1-ST2.



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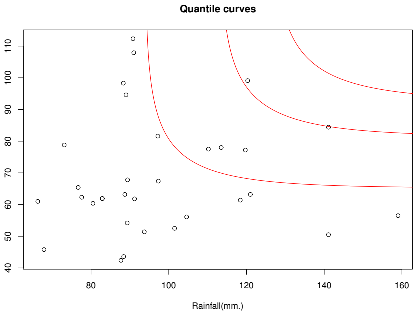

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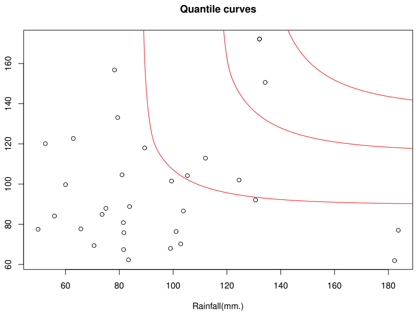
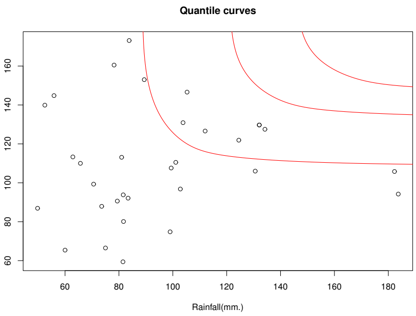
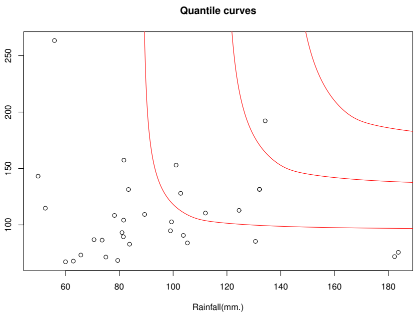


(d) ST1-ST12.



(e) ST1-ST13.



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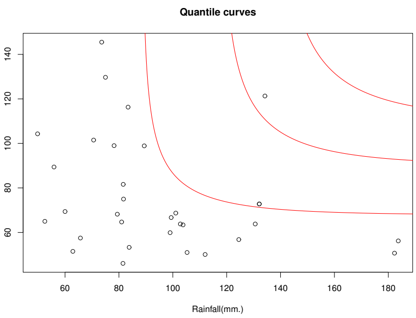

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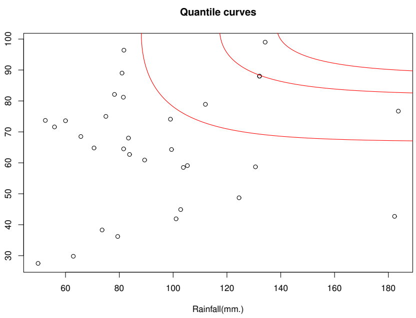
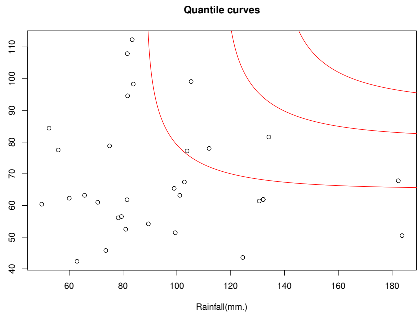
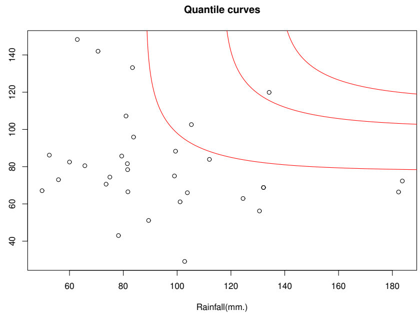


(h) ST1-ST16.

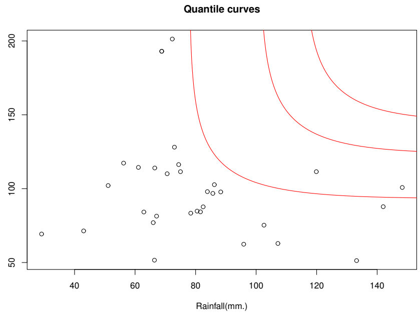
Figure S 2 Quantile plots (p = 0.50, 0.95 and 0.99) of the best model for each pair-stations.



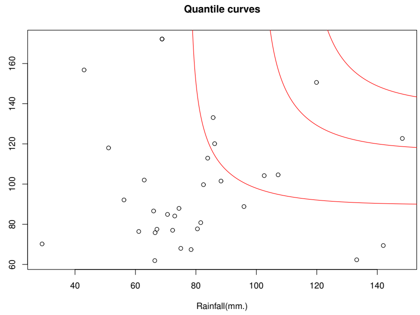
(a) ST1-ST17



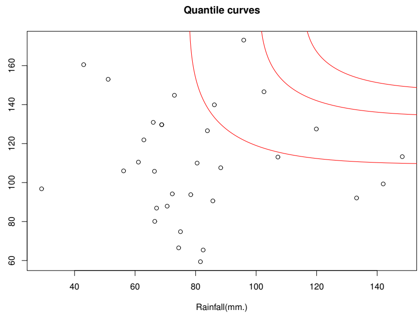
(b) ST1-ST8



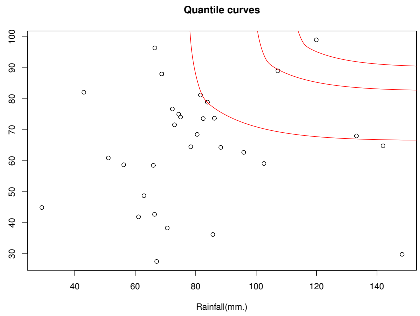
(c) ST2-ST3



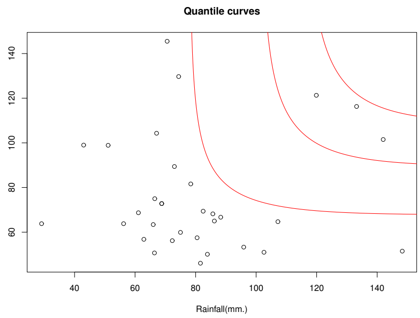
(d) ST2-ST5



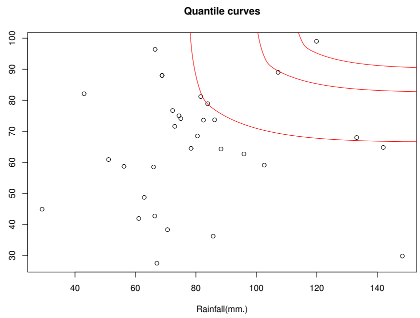
(e) ST2-ST6.



(f) ST2-ST7.

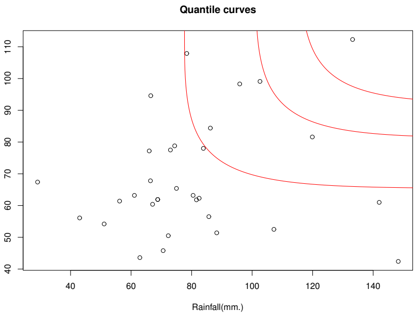


(g) ST2-ST8.

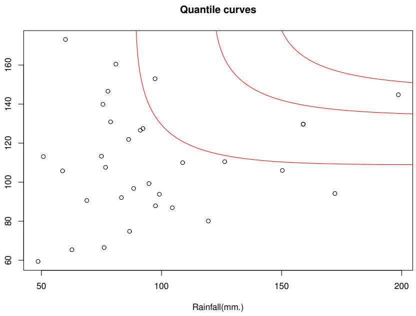


(h) ST2-ST10

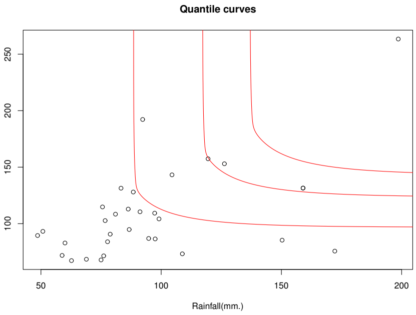
Figure S 3 Quantile plots (p = 0.50, 0.95 and 0.99) of the best model for each pair-stations.



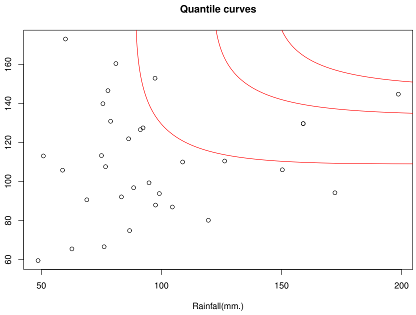
(a) ST2-ST11



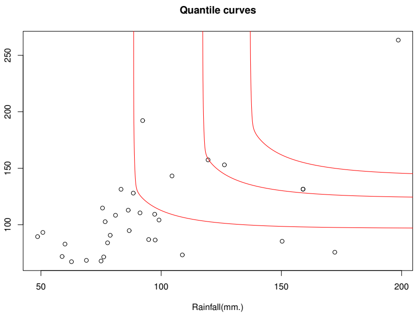
(b) ST2-ST12



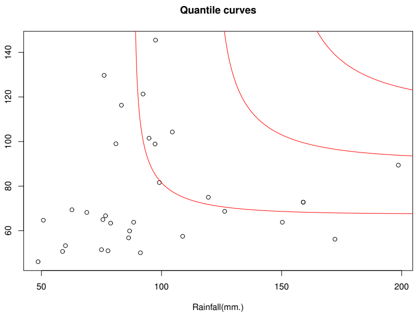
(c) ST2-ST13



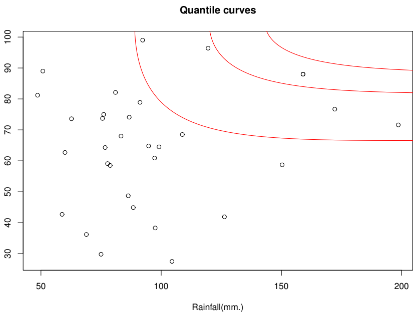
(d) ST2-ST14



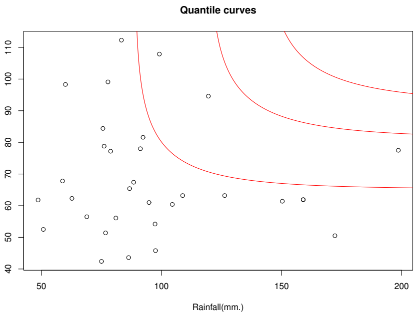
(e) ST2-ST15



(f) ST2-ST16

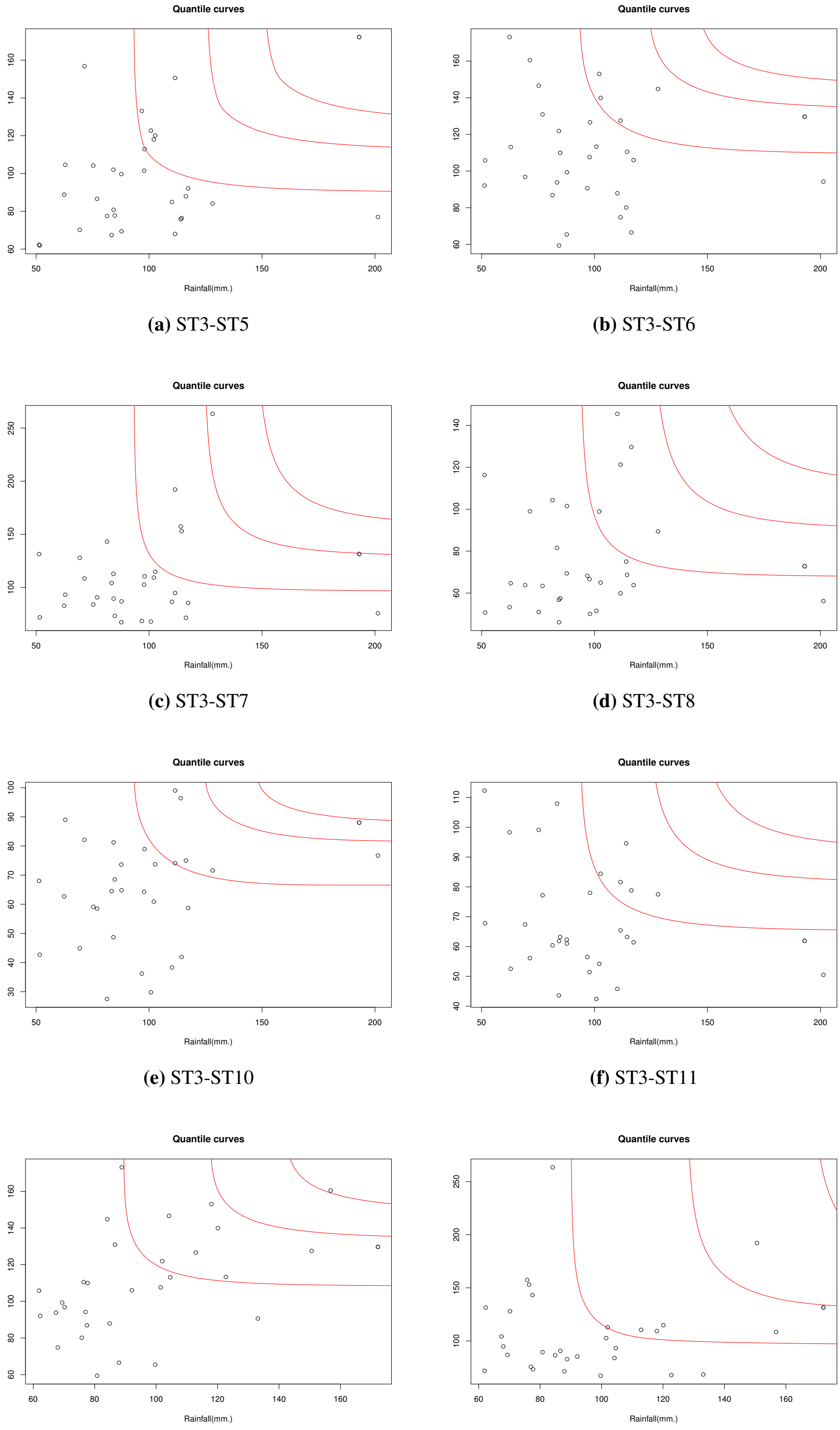


(g) ST2-ST17



(h) ST2-ST18

Figure S 4 Quantile plots (p = 0.50, 0.95 and 0.99) of the best model for each pair-stations.



(a) ST3-ST5

(b) ST3-ST6

(c) ST3-ST7

(d) ST3-ST8

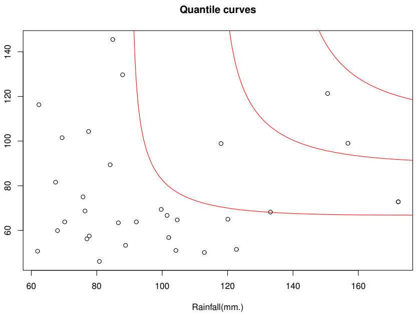
(e) ST3-ST10

(f) ST3-ST11

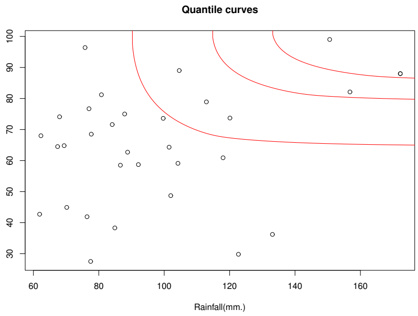
(g) ST3-ST12

(h) ST3-ST13

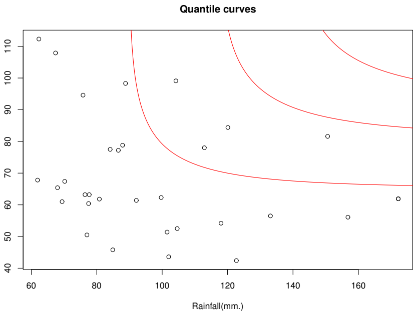
Figure S 5 Quantile plots (p = 0.50, 0.95 and 0.99) of the best model for each pair-stations.



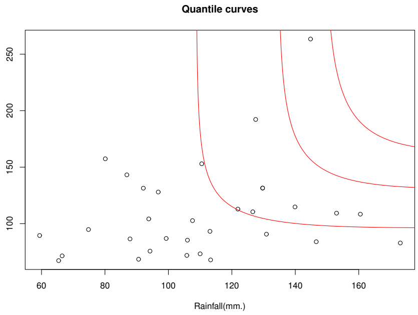
(a) ST3-ST14



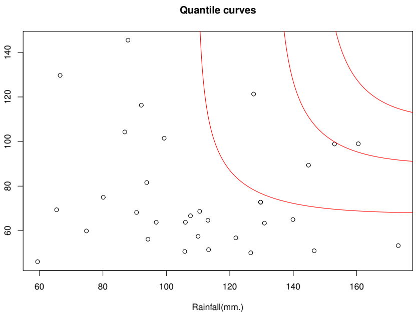
(b) ST3-ST15



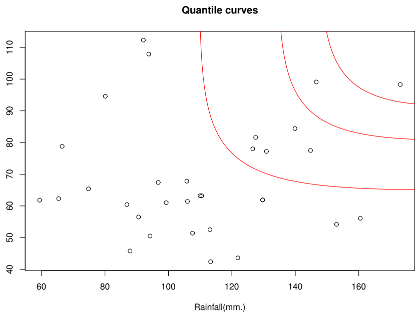
(c) ST3-ST16



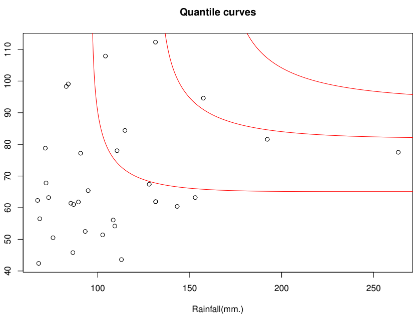
(d) ST3-ST17



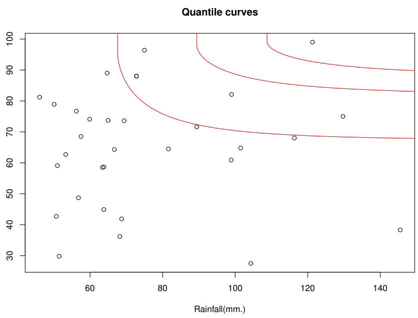
(e) ST3-ST18



(f) ST5-ST7

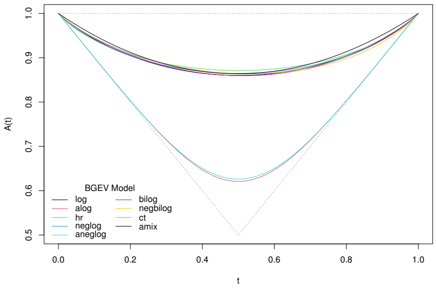


(g) ST5-ST12

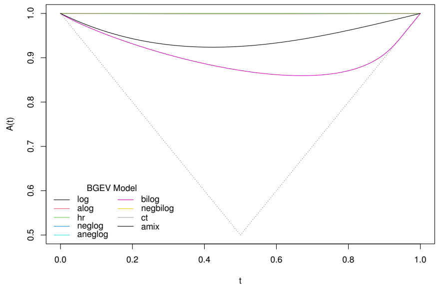


(h) ST5-ST13

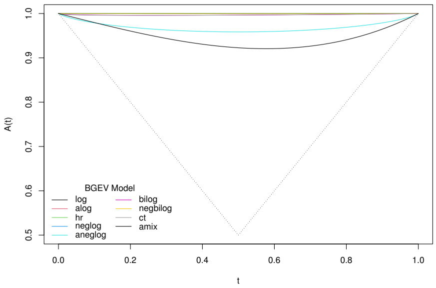
Figure S 6 Quantile plots (p = 0.50, 0.95 and 0.99) of the best model for each pair-stations.



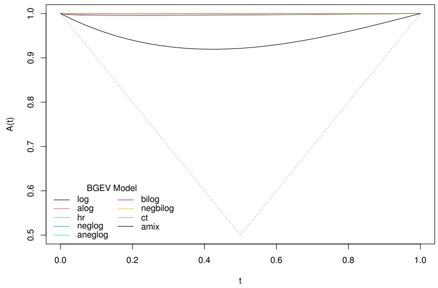
(a) ST1-ST2.



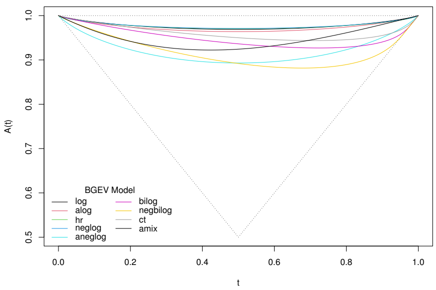
(b) ST1-ST3.



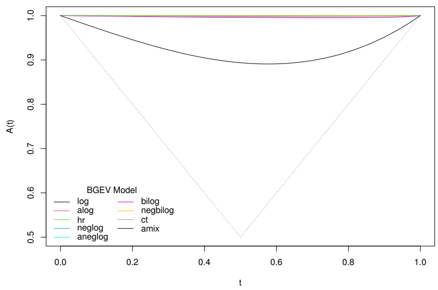
(c) ST1-ST5.



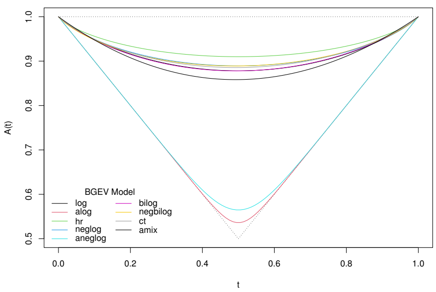
(d) ST1-ST6.



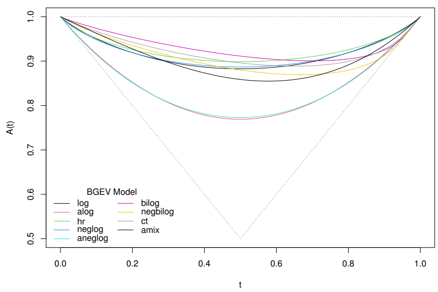
(e) ST1-ST7.



(f) ST1-ST8.



(g) ST1-ST10.



(h) ST1-ST11.

Figure S 7 Dependence functions from BGEV models for each pair-stations.

6. Risk Analysis based on the BGEV model

Table S 8 Return level of rainfall (mm.) and flood risk by regions for each return period.

Region	Return Period(Year)	Rainfall by region (mm.)		T_{and}	Risk
		region 1	region 2		
ST1-ST2	2	83.80	74.95	2.66	1.00
	5	110.24	104.28	8.49	0.98
	10	122.16	121.27	15.02	0.89
	25	148.69	160.64	50.14	0.48
	50	156.60	164.21	65.77	0.39
	100	160.35	164.31	74.78	0.35
ST1-ST3	2	83.80	84.20	4.04	1.00
	5	110.24	111.68	22.96	0.76
	10	122.16	126.36	57.98	0.43
	25	148.69	179.90	787.00	0.04
	50	156.60	223.72	2832.54	0.01
	100	160.35	249.11	5363.16	0.01
ST1-ST4	2	83.80	75.15	4.16	1.00
	5	110.24	97.98	23.69	0.75
	10	122.16	119.55	74.80	0.35
	25	148.69	132.60	386.01	0.08
	50	156.60	157.86	1034.19	0.03
	100	160.35	177.08	1827.91	0.02
ST1-ST5	2	83.80	84.80	4.12	1.00
	5	110.24	109.68	21.47	0.78
	10	122.16	134.73	79.77	0.33
	25	148.69	152.38	522.25	0.06
	50	156.60	172.19	1510.74	0.02
	100	160.35	186.30	2891.81	0.01
ST1-ST6	2	83.80	90.90	3.44	1.00
	5	110.24	117.42	30.66	0.65
	10	122.16	120.93	61.28	0.41
	25	148.69	141.10	658.69	0.05
	50	156.60	147.90	1452.81	0.02
	100	160.35	153.45	2395.31	0.01
ST1-ST7	2	83.80	83.60	3.13	1.00
	5	110.24	122.00	18.05	0.84
	10	122.16	132.10	32.62	0.63
	25	148.69	170.76	159.56	0.18
	50	156.60	182.83	246.30	0.12
	100	160.35	183.27	267.80	0.11
ST1-ST8	2	83.80	74.70	3.53	1.00
	5	110.24	94.38	18.00	0.84
	10	122.16	118.63	95.23	0.29
	25	148.69	139.89	1165.41	0.03
	50	156.60	144.39	2371.40	0.01
	100	160.35	146.35	3317.70	0.01

Table S 9 Return level of rainfall (mm.) and flood risk by regions for each return period (Cont.).

Region	Return Period(Year)	Rainfall by region (mm.)		T_{and}	Risk
		region 1	region 2		
ST1-ST10	2	83.80	97.30	3.59	1.00
	5	110.24	114.32	10.88	0.95
	10	122.16	127.02	20.83	0.79
	25	148.69	193.00	157.16	0.19
	50	156.60	196.15	210.99	0.14
	100	160.35	198.73	250.47	0.12
ST1-ST11	2	83.80	88.35	3.39	1.00
	5	110.24	119.68	19.77	0.81
	10	122.16	148.85	64.17	0.40
	25	148.69	168.50	238.69	0.13
	50	156.60	172.20	378.44	0.08
	100	160.35	172.20	503.42	0.06
ST1-ST12	2	83.80	108.80	3.50	1.00
	5	110.24	130.66	14.32	0.90
	10	122.16	146.42	39.33	0.56
	25	148.69	158.70	139.97	0.21
	50	156.60	165.29	243.27	0.12
	100	160.35	169.19	336.96	0.09
ST1-ST13	2	83.80	98.75	3.85	1.00
	5	110.24	131.48	18.45	0.83
	10	122.16	152.02	40.55	0.55
	25	148.69	183.85	144.64	0.20
	50	156.60	219.26	279.30	0.11
	100	160.35	241.33	391.04	0.08
	50	156.60	135.70	284.31	0.11
	100	160.35	140.60	351.58	0.09
ST1-ST15	2	83.80	66.40	3.42	1.00
	5	110.24	80.74	13.27	0.92
	10	122.16	88.00	30.16	0.66
	25	148.69	94.62	111.62	0.25
	50	156.60	97.39	189.11	0.16
	100	160.35	98.19	232.37	0.13
ST1-ST16	2	83.80	62.75	3.27	1.00
	5	110.24	81.04	17.28	0.85
	10	122.16	97.93	57.43	0.43
	25	148.69	105.79	182.94	0.16
	50	156.60	109.57	271.64	0.11
	100	160.35	110.94	322.17	0.10
ST2-ST3	2	74.95	84.20	3.66	1.00
	5	104.28	111.68	15.82	0.88
	10	121.27	126.36	30.73	0.65
	25	160.64	179.90	115.32	0.24
	50	164.21	223.72	160.53	0.18
	100	164.31	249.11	184.00	0.16

Table S 10 Return level of rainfall (mm.) and flood risk by regions for each return period (Cont.).

Region	RP(Year)	Rainfall by region (mm.)		T_{and}	Risk
		region 1	region 2		
ST2-ST4	2	74.95	75.15	4.21	1.00
	5	104.28	97.98	26.78	0.70
	10	121.27	119.55	85.09	0.32
	25	160.64	132.60	315.62	0.10
	50	164.21	157.86	589.38	0.05
	100	164.31	177.08	841.35	0.04
ST2-ST5	2	74.95	84.80	4.15	1.00
	5	104.28	109.68	23.73	0.75
	10	121.27	134.73	86.41	0.31
	25	160.64	152.38	383.03	0.08
	50	164.21	172.19	739.20	0.04
	100	164.31	186.30	1108.60	0.03
ST2-ST6	2	74.95	90.90	3.48	1.00
	5	104.28	117.42	34.64	0.61
	10	121.27	120.93	69.67	0.37
	25	160.64	141.10	537.63	0.06
	50	164.21	147.90	826.27	0.04
	100	164.31	153.45	1100.12	0.03
ST2-ST7	2	74.95	83.60	2.94	1.00
	5	104.28	122.00	14.78	0.89
	10	121.27	132.10	24.55	0.74
	25	160.64	170.76	89.54	0.30
	50	164.21	182.83	119.95	0.24
	100	164.31	183.27	121.18	0.23
ST2-ST8	2	74.95	74.70	3.36	1.00
	5	104.28	94.38	15.16	0.89
	10	121.27	118.63	53.70	0.45
	25	160.64	139.89	217.89	0.14
	50	164.21	144.39	269.21	0.11
	100	164.31	146.35	290.73	0.10
ST2-ST10	2	74.95	97.30	3.77	1.00
	5	104.28	114.32	12.58	0.93
	10	121.27	127.02	23.73	0.75
	25	160.64	193.00	86.95	0.31
	50	164.21	196.15	93.74	0.29
	100	164.31	198.73	97.19	0.28

Table S 11 Return level of rainfall (mm.) and flood risk by regions for each return period (Cont.).

Region	RP(Year)	Rainfall by region (mm.)		T_{and}	Risk
		region 1	region 2		
ST2-ST11	2	74.95	88.35	3.02	1.00
	5	104.28	119.68	12.11	0.94
	10	121.27	148.85	28.28	0.68
	25	160.64	168.50	62.51	0.40
	50	164.21	172.20	68.26	0.38
	100	164.31	172.20	68.36	0.38
ST2-ST12	2	74.95	108.80	3.18	1.00
	5	104.28	130.66	11.17	0.95
	10	121.27	146.42	25.31	0.73
	25	160.64	158.70	64.10	0.40
	50	164.21	165.29	89.61	0.30
	100	164.31	169.19	109.98	0.25
ST2-ST13	2	74.95	98.75	4.02	1.00
	5	104.28	131.48	23.18	0.76
	10	121.27	152.02	54.20	0.45
	25	160.64	183.85	190.51	0.16
	50	164.21	219.26	303.22	0.10
	100	164.31	241.33	377.45	0.08
ST2-ST14	2	74.95	67.45	3.88	1.00
	5	104.28	98.98	37.47	0.58
	10	121.27	115.10	105.25	0.26
	25	160.64	127.68	400.22	0.08
	50	164.21	135.70	532.01	0.06
	100	164.31	140.60	601.27	0.05
ST2-ST15	2	74.95	66.40	3.22	1.00
	5	104.28	80.74	12.11	0.94
	10	121.27	88.00	25.91	0.72
	25	160.64	94.62	79.43	0.33
	50	164.21	97.39	116.27	0.24
	100	164.31	98.19	132.27	0.22
ST2-ST16	2	74.95	62.75	3.11	1.00
	5	104.28	81.04	14.52	0.90
	10	121.27	97.93	39.94	0.56
	25	160.64	105.79	90.96	0.30
	50	164.21	109.57	107.74	0.26
	100	164.31	110.94	113.00	0.25
ST3-ST4	2	84.20	75.15	3.33	1.00
	5	111.68	97.98	9.06	0.98
	10	126.36	119.55	15.18	0.89
	25	179.90	132.60	35.78	0.60
	50	223.72	157.86	66.67	0.38
	100	249.11	177.08	91.54	0.30

Table S 12 Return level of rainfall (mm.) and flood risk by regions for each return period (Cont.).

Region	RP(Year)	Rainfall by region (mm.)		T_{and}	Risk
		region 1	region 2		
ST3-ST5	2	84.20	84.80	3.44	1.00
	5	111.68	109.68	9.44	0.97
	10	126.36	134.73	17.40	0.85
	25	179.90	152.38	48.40	0.49
	50	223.72	172.19	97.78	0.28
	100	249.11	186.30	140.93	0.20
ST3-ST5	2	74.95	97.30	3.77	1.00
	5	104.28	114.32	12.58	0.93
	10	121.27	127.02	23.73	0.75
	25	160.64	193.00	86.95	0.31
	50	164.21	196.15	93.74	0.29
	100	164.31	198.73	97.19	0.28
ST3-ST6	2	74.95	88.35	3.02	1.00
	5	104.28	119.68	12.11	0.94
	10	121.27	148.85	28.28	0.68
	25	160.64	168.50	62.51	0.40
	50	164.21	172.20	68.26	0.38
	100	164.31	172.20	68.36	0.38
ST3-ST7	2	74.95	108.80	3.18	1.00
	5	104.28	130.66	11.17	0.95
	10	121.27	146.42	25.31	0.73
	25	160.64	158.70	64.10	0.40
	50	164.21	165.29	89.61	0.30
	100	164.31	169.19	109.98	0.25
ST3-ST8	2	74.95	98.75	4.02	1.00
	5	104.28	131.48	23.18	0.76
	10	121.27	152.02	54.20	0.45
	25	160.64	183.85	190.51	0.16
	50	164.21	219.26	303.22	0.10
	100	164.31	241.33	377.45	0.08
ST3-ST10	2	74.95	66.40	3.22	1.00
	5	104.28	80.74	12.11	0.94
	10	121.27	88.00	25.91	0.72
	25	160.64	94.62	79.43	0.33
	50	164.21	97.39	116.27	0.24
	100	164.31	98.19	132.27	0.22

Table S 13 Return level of rainfall (mm.) and flood risk by regions for each return period (Cont.).

Region	RP(Year)	Rainfall by region (mm.)		T_{and}	Risk
		region 1	region 2		
ST3-ST11	2	74.95	62.75	3.11	1.00
	5	104.28	81.04	14.52	0.90
	10	121.27	97.93	39.94	0.56
	25	160.64	105.79	90.96	0.30
	50	164.21	109.57	107.74	0.26
	100	164.31	110.94	113.00	0.25
ST3-ST12	2	84.20	75.15	3.33	1.00
	5	111.68	97.98	9.06	0.98
	10	126.36	119.55	15.18	0.89
	25	179.90	132.60	35.78	0.60
	50	223.72	157.86	66.67	0.38
	100	249.11	177.08	91.54	0.30
ST3-ST13	2	84.20	84.80	3.44	1.00
	5	111.68	109.68	9.44	0.97
	10	126.36	134.73	17.40	0.85
	25	179.90	152.38	48.40	0.49
	50	223.72	172.19	97.78	0.28
	100	249.11	186.30	140.93	0.20
ST3-ST14	2	84.20	67.45	3.29	1.00
	5	111.68	98.98	15.96	0.87
	10	126.36	115.10	30.38	0.66
	25	179.90	127.68	65.64	0.39
	50	223.72	135.70	106.82	0.26
	100	249.11	140.60	140.33	0.21
ST3-ST15	2	84.20	66.40	3.48	1.00
	5	111.68	80.74	13.02	0.92
	10	126.36	88.00	29.03	0.67
	25	179.90	94.62	139.72	0.21
	50	223.72	97.39	404.07	0.08
ST3-ST16	2	84.20	62.75	3.14	1.00
	5	111.68	81.04	11.82	0.94
	10	126.36	97.93	29.56	0.67
	25	179.90	105.79	75.89	0.35
	50	223.72	109.57	134.68	0.21
	100	249.11	110.94	178.64	0.16

Table S 14 Return level of rainfall (mm.) and flood risk by regions for each return period (Cont.).

Region	RP(Year)	Rainfall by region (mm.)		T_{and}	Risk
		region 1	region 2		
ST6-ST7	2	90.90	83.60	2.65	1.00
	5	117.42	122.00	16.76	0.86
	10	120.93	132.10	22.72	0.76
	25	141.10	170.76	95.40	0.29
	50	147.90	182.83	153.01	0.19
	100	153.45	183.27	221.89	0.14
ST6-ST8	2	90.90	74.70	3.20	1.00
	5	117.42	94.38	23.76	0.75
	10	120.93	118.63	91.07	0.30
	25	141.10	139.89	870.14	0.04
	50	147.90	144.39	1625.38	0.02
	100	153.45	146.35	2435.33	0.01
ST6-ST10	2	90.90	97.30	3.82	1.00
	5	117.42	114.32	20.83	0.79
	10	120.93	127.02	35.27	0.60
	25	141.10	193.00	431.42	0.07
	50	147.90	196.15	587.36	0.05
	100	153.45	198.73	748.68	0.04
ST6-ST11	2	90.90	88.35	3.08	1.00
	5	117.42	119.68	18.84	0.83
	10	120.93	148.85	37.50	0.58
	25	141.10	168.50	94.03	0.29
	50	147.90	172.20	120.62	0.23
	100	153.45	172.20	142.45	0.20
ST6-ST12	2	90.90	108.80	3.00	1.00
	5	117.42	130.66	12.58	0.93
	10	120.93	146.42	21.93	0.78
	25	141.10	158.70	55.32	0.44
	50	147.90	165.29	81.13	0.33
	100	153.45	169.19	105.54	0.26
ST6-ST13	2	90.90	98.75	3.14	1.00
	5	117.42	131.48	14.36	0.90
	10	120.93	152.02	20.15	0.80
	25	141.10	183.85	52.91	0.46
	50	147.90	219.26	78.98	0.34
	100	153.45	241.33	103.21	0.27

Table S 15 Return level of rainfall (mm.) and flood risk by regions for each return period (Cont.).

Region	RP(Year)	Rainfall by region (mm.)		T_{and}	Risk
		region 1	region 2		
ST6-ST14	2	90.90	67.45	3.47	1.00
	5	117.42	98.98	43.72	0.52
	10	120.93	115.10	88.40	0.31
	25	141.10	127.68	365.43	0.08
	50	147.90	135.70	640.04	0.05
	100	153.45	140.60	959.39	0.03
ST6-ST15	2	90.90	66.40	3.48	1.00
	5	117.42	80.74	29.07	0.67
	10	120.93	88.00	72.71	0.36
	25	141.10	94.62	604.89	0.05
	50	147.90	97.39	1668.58	0.02
	100	153.45	98.19	2810.27	0.01
ST6-ST16	2	90.90	62.75	3.04	1.00
	5	117.42	81.04	24.40	0.74
	10	120.93	97.93	67.76	0.38
	25	141.10	105.79	208.85	0.14
	50	147.90	109.57	308.90	0.10
	100	153.45	110.94	392.10	0.08

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