

Supplementary Material:
Employing the Generalized Pareto Distribution to Analyze Extreme
Rainfall Events on Consecutive Rainy Days in Thailand's Chi Watershed:
Implications for Flood Management

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1. Descriptive statistics

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

Station ID	Station Name	Province	Latitude	Longitude
48353	Loei	Loei	17°45'	101°73'
48350	Loei Agromet*	Loei	17°40'	101°73'
48354	Udon Thani	Udon Thani	17°38'	102°80'
48360	Nong Bua Lamphu	Nong Bua Lamphu	16°24'	101°94'
48381	Khon Kaen	Khon Kaen	17°25'	102°98'
48384	Tha Phra Agromet*	Khon Kaen	16°33'	102°82'
48383	Mukdahan	Mukdahan	16°53'	104°72'
48382	Maha Sarakham	Maha Sarakham	17°07'	103°15'
48390	Kalasin	Kalasin	16°24'	102°78'
48403	Chaiyaphum	Chaiyaphum	15°80'	102°03'
48405	Roi Et	Roi Et	16°05'	103°68'
48404	Roi Et Agromet*	Roi Et	16°07'	103°62'
48408	Ubon Ratchathani Agromet*	Ubon Ratchathani	15°93'	105°60'
48407	Ubon Ratchathani	Ubon Ratchathani	15°25'	104°87'
48409	Sisaket	Sisaket	15°03'	104°25'
48431	Nakhon Ratchasima	Nakhon Ratchasima	15°72'	102°67'
48435	Pak Chong Agromet*	Nakhon Ratchasima	15°27'	101°57'
48434	Chok Chai	Nakhon Ratchasima	14°85'	102°28'

Note: * is sub-station of Meteorological Department for Agricultural.

Table S 2: Preliminary data of rainfall on consecutive rainy days at Loei station (48353).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	336	0.2	18.4	115.0
3	198	0.8	34.4	147.8
4	143	2.5	42.3	202.2
5	84	5.5	51.9	232.4
6	59	11.2	69.8	304.2
7	34	5.4	84.6	211.5
8	17	14.8	90.1	258.8
9	18	18.4	112.5	239.6
10	14	32.4	123.1	275.6
11	6	55.1	202.1	317.0
12	9	54.2	129.7	233.9
13	3	109.1	167.4	200.8
14	3	157.8	173.2	193.4
15	2	155.7	166.4	177.0
16	3	138.3	183.6	210.0
17	2	146.7	258.6	370.4
19	1	192.5	192.5	192.5
21	1	368.4	368.4	368.4
22	1	607.2	607.2	607.2
Total	934	0.2	161.9	607.2

Table S 3: Preliminary data of rainfall on consecutive rainy days at Loei Agromet station (48350).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	364	0.2	17.4	129.1
3	199	1.0	31.2	114.8
4	125	3.5	47.1	230.4
5	76	3.0	56.1	164.4
6	68	3.6	71.7	304.2
7	31	20.5	73.6	146.1
8	29	22.8	96.6	267.5
9	12	18.5	98.1	174.0
10	16	48.3	134.2	311.5
11	4	124.9	256.8	367.1
12	3	130.7	186.2	219.3
13	4	103.0	152.7	212.1
14	2	147.9	159.6	171.2
15	3	140.3	158.9	185.8
16	4	63.1	162.4	311.6
18	1	221.8	221.8	221.8
19	1	583.1	583.1	583.1
22	1	117.0	117.0	117.0
Total	943	0.2	145.8	583.1

Table S 4: Preliminary data of rainfall on consecutive rainy days at Udon Thani station (48354).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	324	0.3	18.9	178.5
3	188	0.6	33.2	155.0
4	121	2.5	52.2	154.5
5	85	9.1	59.8	185.4
6	61	19.2	79.6	245.4
7	42	4.5	92.0	429.5
8	17	46.7	119.3	226.1
9	21	30.6	149.7	309.1
10	10	36.2	126.3	194.5
11	5	73.2	92.9	111.8
12	7	112.8	150.9	219.6
13	7	80.3	187.1	245.6
14	4	127.3	238.4	344.8
15	1	133.5	133.5	133.5
16	5	85.8	298.9	451.3
17	3	137.6	171.7	194.1
18	1	299.9	299.9	299.9
19	2	133.3	210.4	287.5
Total	904	0.3	139.7	451.3

Table S 5: Preliminary data of rainfall on consecutive rainy days at Nong Bua Lamphu station (48360).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	74	0.7	20.5	84.4
3	33	2.2	42.6	95.6
4	35	4.2	53.7	230.0
5	13	5.8	51.9	137.7
6	10	52.2	91.5	152.8
7	7	28.3	108.1	178.0
8	1	156.0	156.0	156.0
9	5	81.7	202.0	473.3
10	1	37.7	37.7	37.7
11	1	84.7	84.7	84.7
13	1	134.1	134.1	134.1
14	2	78.1	125.0	171.8
15	1	143.8	143.8	143.8
17	1	174.3	174.3	174.3
Total	185	0.7	101.8	473.3

Table S 6: Preliminary data of rainfall on consecutive rainy days at Khon Kaen station (48381).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	347	0.2	20.7	155.8
3	184	0.8	36.3	233.6
4	142	3.0	50.0	173.3
5	75	6.4	65.1	216.6
6	43	16.6	76.1	153.0
7	22	24.0	80.3	228.5
8	21	27.6	83.8	190.1
9	14	28.7	110.3	173.2
10	6	92.7	126.3	182.7
11	1	206.8	206.8	206.8
12	4	74.1	121.5	189.0
13	4	111.5	214.4	363.4
14	2	132.6	180.4	228.1
15	3	110.9	223.0	303.0
Total	868	0.2	113.9	363.4

Table S 7: Preliminary data of rainfall on consecutive rainy days at Tha Phra Agromet station (48384).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	357	0.4	22.7	194.0
3	201	0.8	33.9	171.1
4	96	2.4	49.4	156.9
5	82	6.6	71.1	188.8
6	42	10.3	78.4	289.8
7	23	25.6	89.9	200.2
8	10	35.1	111.7	264.7
9	6	44.8	89.1	123.7
10	8	64.3	114.9	162.6
11	4	71.3	158.7	271.2
12	4	38.7	130.4	215.5
13	2	124.0	270.1	416.2
15	1	200.9	200.9	200.9
16	1	194.8	194.8	194.8
18	1	308.9	308.9	308.9
Total	838	0.4	128.3	416.2

Table S 8: Preliminary data of rainfall on consecutive rainy days at Mukdahan station (48383).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	340	0.2	19.6	129.3
3	186	1.0	40.1	263.5
4	104	5.8	52.9	160.4
5	77	4.1	67.6	169.9
6	45	28.0	82.4	221.0
7	34	10.8	107.0	245.7
8	24	30.4	145.3	336.4
9	18	67.9	146.7	320.3
10	10	69.7	146.3	243.5
11	10	55.7	187.1	355.4
12	8	79.8	228.6	387.7
13	2	297.7	304.4	311.1
14	6	108.3	220.6	357.1
15	1	425.0	425.0	425.0
16	3	207.0	243.7	314.1
17	1	176.2	176.2	176.2
18	1	336.0	336.0	336.0
22	1	379.5	379.5	379.5
24	1	274.5	274.5	274.5
28	1	611.1	611.1	611.1
Total	873	0.2	209.7	611.1

Table S 9: Preliminary data of rainfall on consecutive rainy days at Maha Sarakham (48382).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	392	0.3	23.5	164.8
3	189	0.6	39.7	189.1
4	108	4.7	55.7	212.1
5	63	3.6	81.0	228.0
6	43	12.0	86.0	210.4
7	22	24.3	100.5	243.6
8	13	44.9	97.5	168.0
9	16	55.5	162.4	382.2
10	7	76.7	128.2	163.1
11	4	51.0	137.6	221.5
12	2	112.8	174.0	235.2
17	1	277.3	277.3	277.3
20	1	313.5	313.5	313.5
Total	861	0.3	129.0	382.2

Table S 10: Preliminary data of rainfall on consecutive rainy days at Kalasin (48390).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	140	0.4	22.5	171.4
3	65	2.8	32.8	151.3
4	36	6.6	53.6	141.7
5	26	9.2	69.8	228.4
6	28	11.5	105.2	303.0
7	11	39.6	83.8	124.1
8	5	59.8	113.2	215.6
9	4	104.3	145.4	227.7
10	1	185.1	185.1	185.1
12	1	174.6	174.6	174.6
13	3	130.0	163.1	207.0
14	1	199.4	199.4	199.4
15	1	291.3	291.3	291.3
16	1	286.9	286.9	286.9
Total	323	0.4	137.6	303.0

Table S 11: Preliminary data of rainfall on consecutive rainy days at Chaiyaphum (48403).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	321	0.3	21.4	201.6
3	206	1.5	37.5	163.4
4	114	4.5	45.6	207.9
5	60	3.6	55.1	211.0
6	59	9.0	70.9	143.4
7	20	19.4	82.2	196.1
8	16	56.3	117.1	199.6
9	10	23.2	128.3	224.3
10	4	39.1	109.5	167.7
11	3	125.3	200.0	248.5
12	3	50.6	108.0	158.9
13	1	379.2	379.2	379.2
Total	817	0.3	112.9	379.2

Table S 12: Preliminary data of rainfall on consecutive rainy days at Roi Et (48405).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	356	0.2	23.5	135.1
3	206	1.5	36.6	212.8
4	120	4.0	58.2	183.3
5	54	2.2	61.5	182.1
6	52	23.4	84.7	188.8
7	34	21.4	97.6	272.6
8	15	19.5	153.8	297.5
9	13	14.8	141.8	294.2
10	4	56.3	94.3	131.7
11	8	104.4	187.1	335.4
12	5	112.6	185.2	295.0
13	4	90.7	179.9	242.1
14	1	180.6	180.6	180.6
15	2	171.4	182.0	192.5
17	1	302.8	302.8	302.8
19	1	133.1	133.1	133.1
Total	876	0.2	131.4	335.4

Table S 13: Preliminary data of rainfall on consecutive rainy days at Roi Et Agromet (48404).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	368	0.4	21.6	141.8
3	188	1.2	43.8	182.1
4	107	4.4	65.7	330.0
5	66	7.9	69.7	228.3
6	38	15.4	74.1	177.9
7	22	36.4	98.8	195.9
8	13	16.6	112.4	197.3
9	14	53.4	133.2	240.4
10	9	79.8	161.3	288.4
11	9	55.6	199.2	343.3
12	2	137.2	200.7	264.2
14	3	159.0	218.0	295.7
16	1	199.8	199.8	199.8
17	2	222.0	239.4	256.8
Total	842	0.4	131.3	343.3

Table S 14: Preliminary data of rainfall on consecutive rainy days at Ubon Ratchathani Agromet (48408).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	305	0.4	22.5	123.0
3	190	0.4	33.2	192.6
4	92	1.9	62.7	360.1
5	82	1.8	70.1	195.2
6	51	12.6	93.2	270.5
7	32	22.5	95.0	186.4
8	24	18.6	127.2	278.7
9	23	46.0	140.3	322.1
10	17	61.0	150.7	255.6
11	9	80.2	148.5	233.6
12	9	129.7	224.3	360.5
13	2	304.6	306.1	307.6
14	5	105.7	199.9	250.5
15	5	126.8	232.6	357.1
16	3	152.9	356.4	499.0
17	1	255.7	255.7	255.7
18	2	190.0	217.4	244.8
21	1	319.9	319.9	319.9
28	3	378.9	452.2	488.9
Total	856	0.4	184.6	499.0

Table S 15: Preliminary data of rainfall on consecutive rainy days at Ubon Ratchathani station (48407).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	321	0.3	22.6	129.4
3	187	1.7	42.1	206.3
4	104	5.0	52.6	160.7
5	66	8.0	69.9	227.6
6	50	10.3	97.1	234.4
7	32	28.8	115.2	250.5
8	31	30.7	149.9	423.5
9	22	20.7	154.3	393.7
10	7	76.8	130.9	161.4
11	7	134.9	196.6	291.6
12	9	112.1	186.2	263.7
13	2	170.1	185.1	200.1
14	3	104.6	191.3	287.6
15	5	201.3	259.3	382.2
16	4	185.8	284.0	406.4
17	2	254.8	332.7	410.6
18	3	253.0	281.6	296.7
Total	855	0.3	161.8	423.5

Table S 16: Preliminary data of rainfall on consecutive rainy days at Sisaket (48409).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	331	0.2	23.5	143.0
3	163	1.1	38.6	197.8
4	98	7.5	55.2	174.3
5	76	5.0	72.7	364.2
6	47	11.3	104.0	251.1
7	43	15.8	116.3	428.1
8	21	47.3	139.9	270.6
9	13	67.1	134.0	271.4
10	11	41.6	180.1	391.0
11	5	124.1	162.0	198.1
12	2	145.8	181.9	218.0
13	3	126.2	139.5	166.1
14	2	75.3	261.1	446.8
15	2	140.6	204.0	267.3
16	1	218.1	218.1	218.1
17	1	189.3	189.3	189.3
18	1	206.2	206.2	206.2
Total	820	0.2	142.7	446.8

Table S 17: Preliminary data of rainfall on consecutive rainy days at Nakhon Ratchasima (48431).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	394	0.2	18.1	132.1
3	207	0.5	33.0	173.7
4	111	3.3	47.7	210.0
5	71	3.3	60.0	238.9
6	34	15.7	79.4	181.6
7	25	16.2	69.7	174.9
8	12	24.8	88.6	127.7
9	11	66.0	131.8	253.0
10	4	86.0	113.7	124.4
11	1	222.4	222.4	222.4
12	1	252.3	252.3	252.3
13	4	92.7	210.7	446.2
14	1	115.5	115.5	115.5
21	1	234.4	234.4	234.4
Total	877	0.2	119.8	446.2

Table S 18: Preliminary data of rainfall on consecutive rainy days at Pak Chong Agromet (48435).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	379	0.2	15.6	99.6
3	233	0.6	28.5	114.7
4	134	2.1	40.3	167.9
5	75	5.4	60.0	209.2
6	44	17.1	63.0	215.2
7	31	16.9	75.7	163.7
8	23	24.9	62.4	132.6
9	11	37.6	95.7	255.3
10	10	26.7	111.3	208.6
11	7	71.9	148.6	244.7
12	2	132.2	134.4	136.6
13	4	134.1	178.4	228.3
14	2	166.0	211.7	257.4
15	1	367.4	367.4	367.4
16	1	142.9	142.9	142.9
23	1	247.5	247.5	247.5
Total	958	0.2	124.0	367.4

Table S 19: Preliminary data of rainfall on consecutive rainy days at Chok Chai (48434).

Number of CONS-n days	Number of occurrences (times)	Rainfall(mm.)		
		Min	Avg	Max
2	395	0.2	16.6	103.3
3	189	0.6	29.6	155.7
4	111	2.3	42.1	179.2
5	81	7.3	50.8	180.2
6	39	6.7	66.7	149.6
7	30	21.6	82.7	179.8
8	8	33.0	67.4	117.6
9	10	56.9	121.3	195.3
10	7	65.2	152.5	291.6
11	3	55.5	85.1	121.1
12	2	101.2	119.8	138.4
13	2	84.8	115.3	145.8
14	1	106.3	106.3	106.3
16	2	215.1	240.1	265.1
17	1	173.3	173.3	173.3
18	1	301.4	301.4	301.4
Total	882	0.2	110.7	301.4

Table S 20: Descriptive statistics of maximum cumulative rainfall of CONS-2 days for some stations.

Station	Min	Max	Avg	Median	Skewness	Kurtosis
48353	0.1	154.9	13.23	6.20	2.72	10.29
48350	0.1	174.8	13.34	6.60	2.73	10.45
48354	0.1	184.7	14.35	6.00	2.66	9.78
48360	0.1	335.1	19.12	9.50	3.20	17.85
48381	0.1	239.1	20.29	10.40	2.50	8.94
48384	0.1	302.8	19.38	10.00	2.78	12.82
48383	0.1	279.5	17.92	8.80	2.84	13.45
48382	0.1	245.1	17.83	8.80	2.70	11.02
48390	0.1	196.5	15.61	7.10	2.42	8.57
48403	0.1	251.7	17.79	8.40	3.28	16.65
48405	0.1	236.7	17.59	8.50	2.75	11.47
48404	0.1	316.9	19.03	9.10	2.72	12.25
48408	0.1	283.5	15.95	7.70	2.93	14.14
48407	0.1	269.4	15.72	7.30	2.61	11.74
48409	0.1	310.4	17.65	8.60	3.71	25.66
48431	0.1	309.3	17.32	8.45	2.96	16.44
48435	0.1	253.6	15.21	7.40	2.92	14.30
48434	0.1	253.1	15.35	7.40	2.81	12.30

Table S 21: Descriptive statistics of maximum cumulative rainfall of CONS-3 days for some stations.

Station	Min	Max	Avg	Median	Skewness	Kurtosis
48353	0.1	154.9	13.23	6.20	2.72	10.29
48350	0.1	174.8	13.34	6.60	2.73	10.45
48354	0.1	184.7	14.35	6.00	2.66	9.78
48360	0.1	335.1	19.12	9.50	3.20	17.85
48381	0.1	239.1	20.29	10.40	2.50	8.94
48384	0.1	302.8	19.38	10.00	2.78	12.82
48383	0.1	279.5	17.92	8.80	2.84	13.45
48382	0.1	245.1	17.83	8.80	2.70	11.02
48390	0.1	196.5	15.61	7.10	2.42	8.57
48403	0.1	251.7	17.79	8.40	3.28	16.65
48405	0.1	236.7	17.59	8.50	2.75	11.47
48404	0.1	316.9	19.03	9.10	2.72	12.25
48408	0.1	283.5	15.95	7.70	2.93	14.14
48407	0.1	269.4	15.72	7.30	2.61	11.74
48409	0.1	310.4	17.65	8.60	3.71	25.66
48431	0.1	309.3	17.32	8.45	2.96	16.44
48435	0.1	253.6	15.21	7.40	2.92	14.30
48434	0.1	253.1	15.35	7.40	2.81	12.30

Table S 22: Descriptive statistics of maximum cumulative rainfall of CONS-4 days for some stations.

Station	Min	Max	Avg	Median	Skewness	Kurtosis
48353	0.1	179.2	20.00	10.90	2.20	6.13
48350	0.1	222.8	20.40	11.60	2.52	9.26
48354	0.1	247.3	21.32	11.00	2.50	8.95
48360	0.1	361.8	28.97	17.00	2.65	11.49
48381	0.1	295.7	31.41	18.50	2.04	5.63
48384	0.1	360.1	30.57	18.40	2.24	7.66
48383	0.1	330.0	26.82	15.20	2.37	9.14
48382	0.1	264.9	26.98	15.40	2.23	7.28
48390	0.1	211.9	23.26	12.60	2.10	6.07
48403	0.1	296.9	27.19	14.60	2.71	11.20
48405	0.1	310.7	26.35	14.95	2.37	8.83
48404	0.1	330.1	29.58	16.80	2.24	7.41
48408	0.1	296.4	24.03	14.05	2.57	10.76
48407	0.1	273.6	24.23	14.10	2.26	8.38
48409	0.2	378.4	27.60	15.40	3.30	21.22
48431	0.1	340.3	27.17	16.50	2.40	10.00
48435	0.1	284.0	23.57	13.70	2.61	11.25
48434	0.1	282.6	23.87	13.50	2.43	9.57

Table S 23: Descriptive statistics of maximum cumulative rainfall of CONS-5 days for some stations.

Station	Min	Max	Avg	Median	Skewness	Kurtosis
48353	7.30	180.20	50.44	39.35	1.31	1.49
48350	5.40	209.20	61.08	43.15	1.36	1.36
48354	3.30	238.90	58.50	49.00	1.91	5.55
48360	5.00	364.20	69.94	56.95	2.64	9.22
48381	8.00	227.60	69.43	70.00	1.06	1.98
48384	1.80	195.20	69.28	66.50	0.56	-0.21
48383	7.90	228.30	68.88	60.00	1.37	2.10
48382	2.20	182.10	59.11	58.95	0.66	0.59
48390	3.60	211.00	53.98	35.70	1.43	2.40
48403	9.20	228.40	70.44	52.10	1.30	1.02
48405	3.60	228.00	75.96	65.00	1.06	1.06
48404	4.10	169.90	66.92	63.15	0.52	-0.49
48408	6.60	188.80	70.49	62.15	1.17	0.87
48407	6.40	216.60	67.20	58.75	1.37	2.31
48409	5.80	137.70	51.28	44.50	0.97	0.27
48431	9.10	185.40	59.54	52.85	0.78	0.31
48435	3.00	164.40	55.90	44.10	1.08	0.64
48434	5.50	232.40	51.85	45.15	2.03	6.63

Table S 24: Descriptive statistics of maximum cumulative rainfall of CONS-6 days for some stations.

Station	Min	Max	Avg	Median	Skewness	Kurtosis
48353	6.70	149.60	61.82	50.50	0.63	-0.74
48350	17.10	215.20	58.97	43.50	1.52	3.25
48354	15.70	181.60	78.87	59.80	0.96	-0.39
48360	11.30	251.10	99.31	84.90	0.74	-0.15
48381	10.30	234.40	94.36	74.80	0.84	-0.28
48384	12.60	270.50	88.24	75.70	1.13	1.43
48383	15.40	177.90	76.10	65.40	0.55	-0.43
48382	23.40	188.80	85.29	70.70	0.80	-0.27
48390	9.00	143.4	70.90	71.40	0.01	-0.76
48403	11.5	303.0	107.90	85.30	1.02	-0.11
48405	12.00	210.40	82.85	70.60	0.91	0.35
48404	28.00	221.00	84.11	70.60	1.16	0.98
48408	10.30	289.80	78.60	57.10	1.82	3.33
48407	16.60	153.00	77.16	75.10	0.25	-0.99
48409	52.20	152.80	91.88	96.80	0.34	-1.19
48431	19.20	245.40	79.24	71.10	1.41	2.38
48435	3.60	154.20	65.74	61.40	0.40	-0.37
48434	11.20	304.20	69.82	55.80	1.69	4.36

Table S 25: Descriptive statistics of maximum cumulative rainfall of CONS-7 days for some stations.

Station	Min	Max	Avg	Median	Skewness	Kurtosis
48353	0.1	232.8	29.32	18.20	1.85	4.19
48350	0.1	314.1	30.55	20.00	2.05	6.10
48354	0.1	313.9	31.21	18.80	2.23	6.93
48360	0.1	428.1	43.70	29.75	2.13	7.05
48381	0.1	379.3	47.74	31.80	1.70	3.75
48384	0.1	365.3	46.77	31.10	1.78	4.38
48383	0.1	361.2	39.72	26.20	1.92	5.65
48382	0.1	300.4	40.49	27.50	1.76	4.17
48390	0.1	257.1	33.76	20.90	1.77	3.82
48403	0.1	337	40.48	24.60	2.05	6.07
48405	0.1	375.2	38.60	25.50	1.92	5.86
48404	0.1	392.8	44.80	29.10	1.88	4.85
48408	0.1	291.7	34.79	23.00	1.91	5.22
48407	0.1	279.1	35.88	24.40	1.64	3.69
48409	0.2	456.1	41.84	26.10	2.77	15.39
48431	0.1	429.5	41.14	28.50	2.00	6.70
48435	0.1	420.7	35.43	23.20	2.29	9.10
48434	0.1	434.2	36.11	23.40	2.10	7.74

2. Box plot and density plot

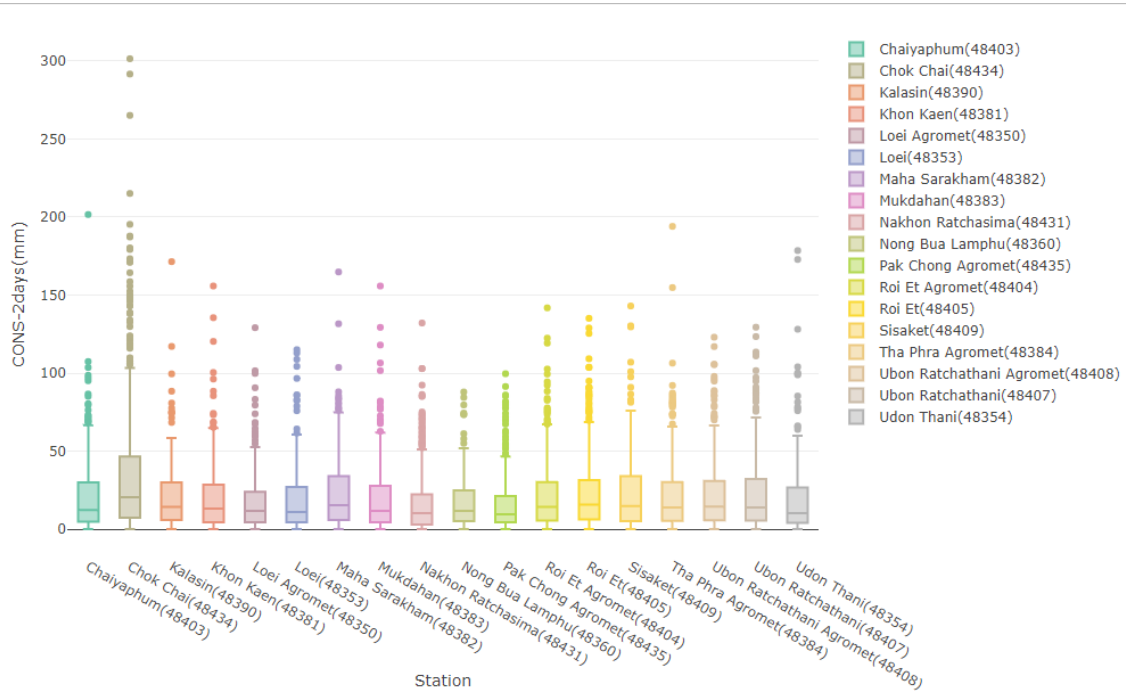


Figure S 1: Box plot of cumulative rainfall on CONS-2 days (mm.) for all stations.

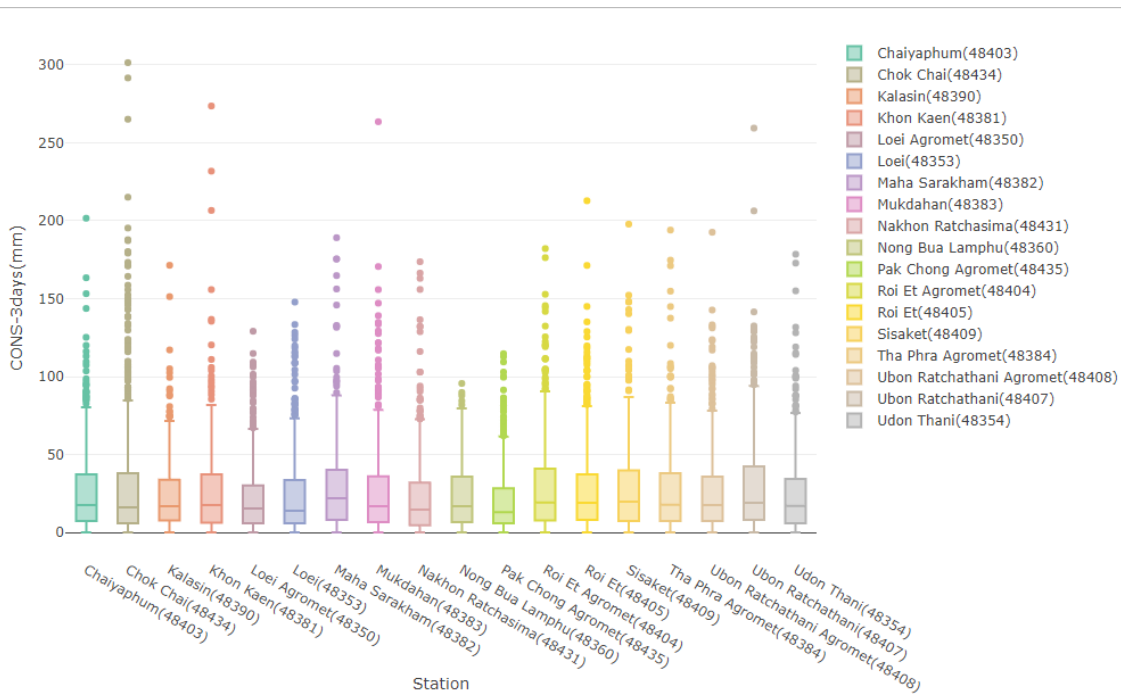


Figure S 2: Box plot of cumulative rainfall on CONS-3 days(mm.) for all stations.

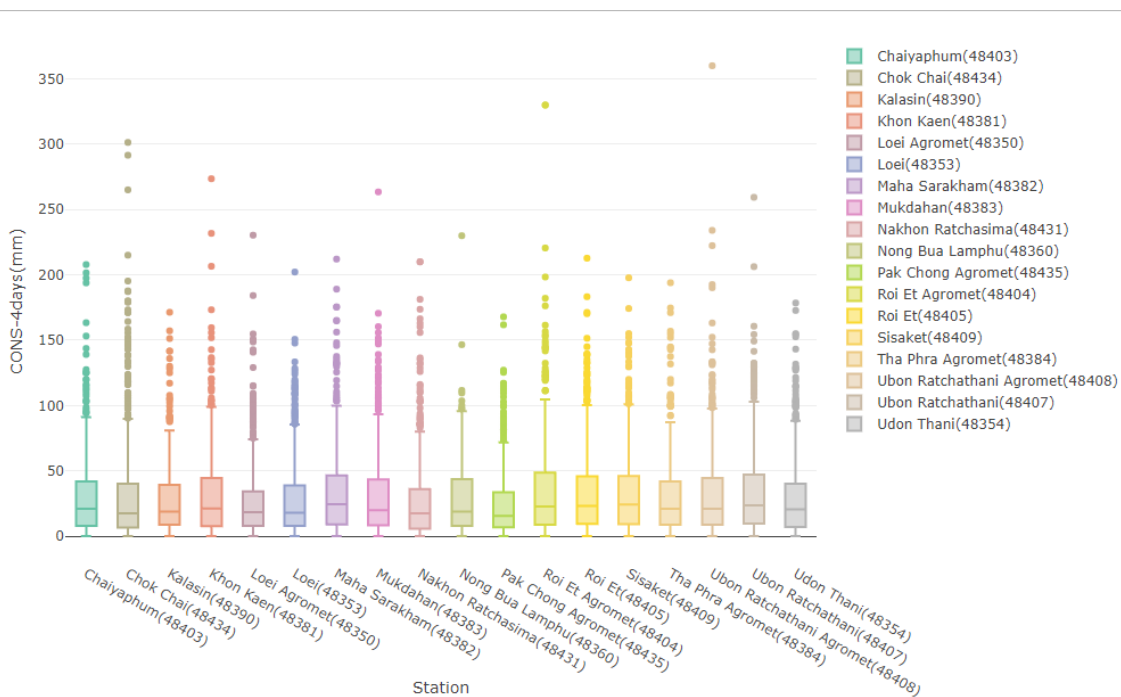


Figure S 3: Box plot of cumulative rainfall on CONS-4 days(mm.) for all stations.

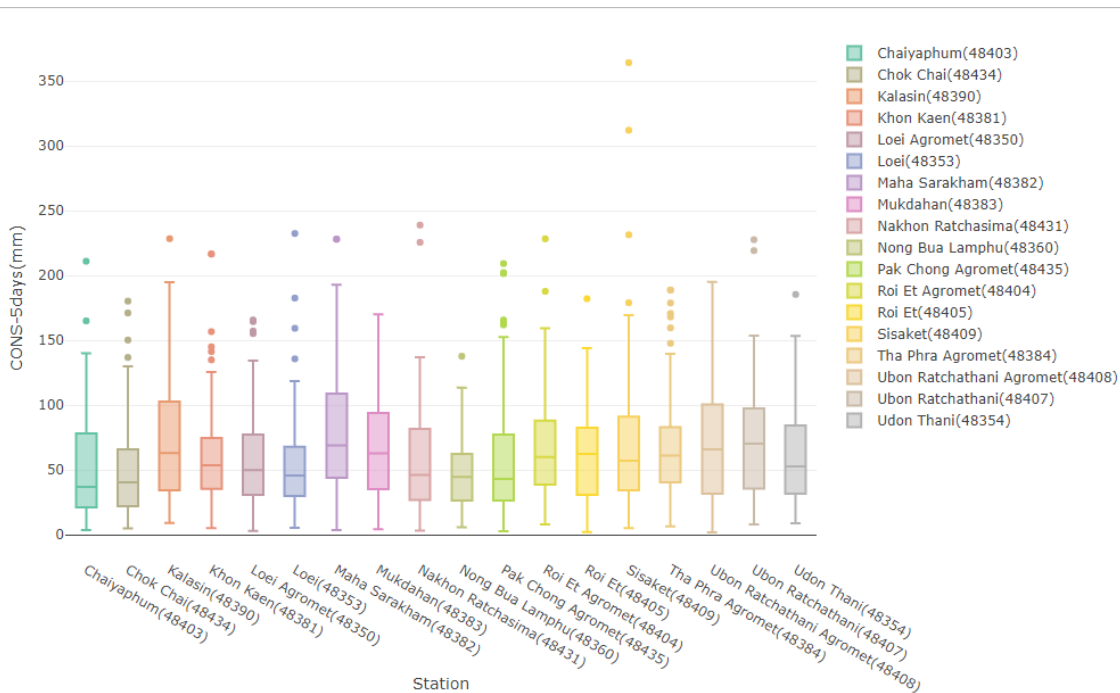


Figure S 4: Box plot of cumulative rainfall on CONS-5 days(mm.) for all stations.

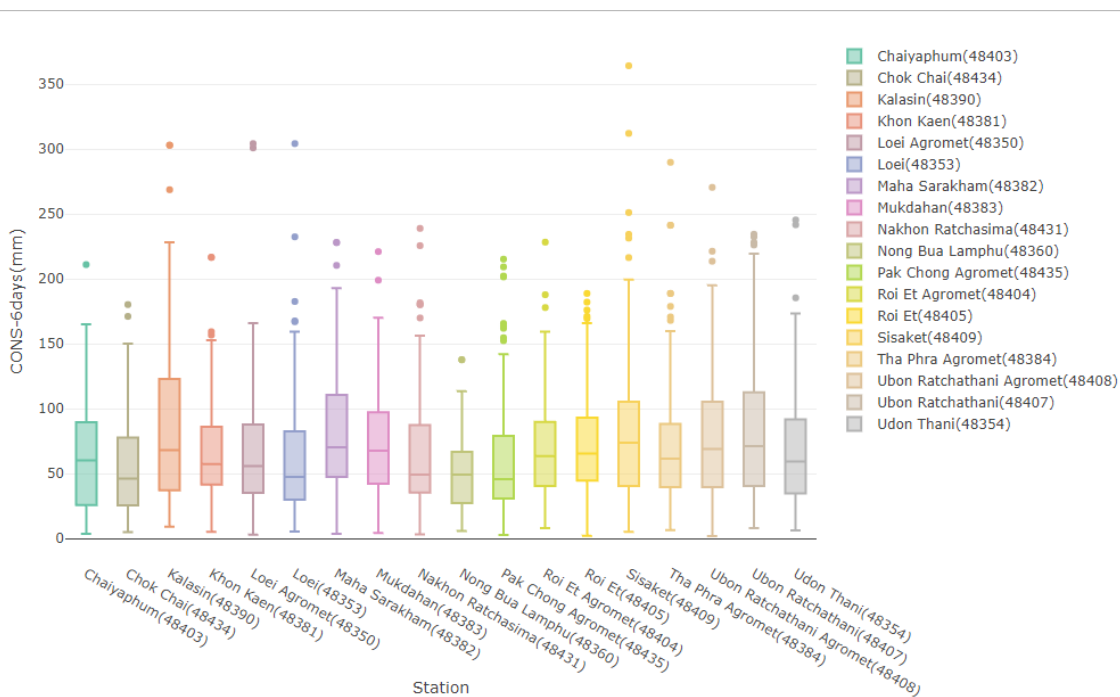


Figure S 5: Box plot of cumulative rainfall on CONS-6 days(mm.) for all stations.

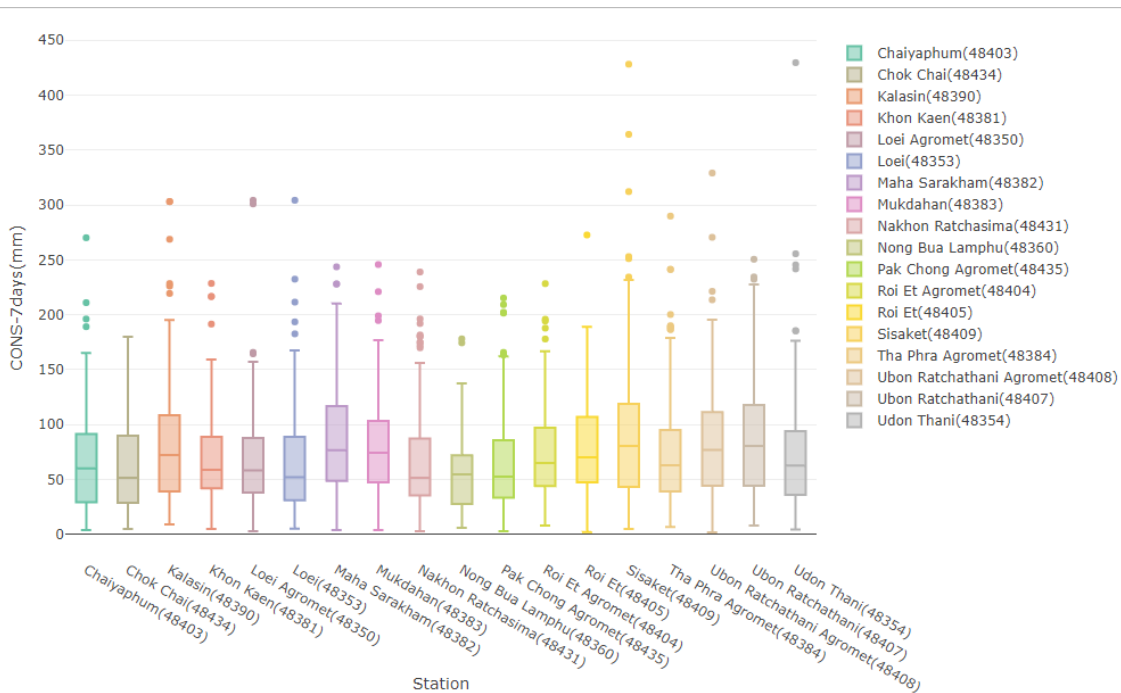


Figure S 6: Box plot of cumulative rainfall on CONS-7 days(mm.) for all stations.

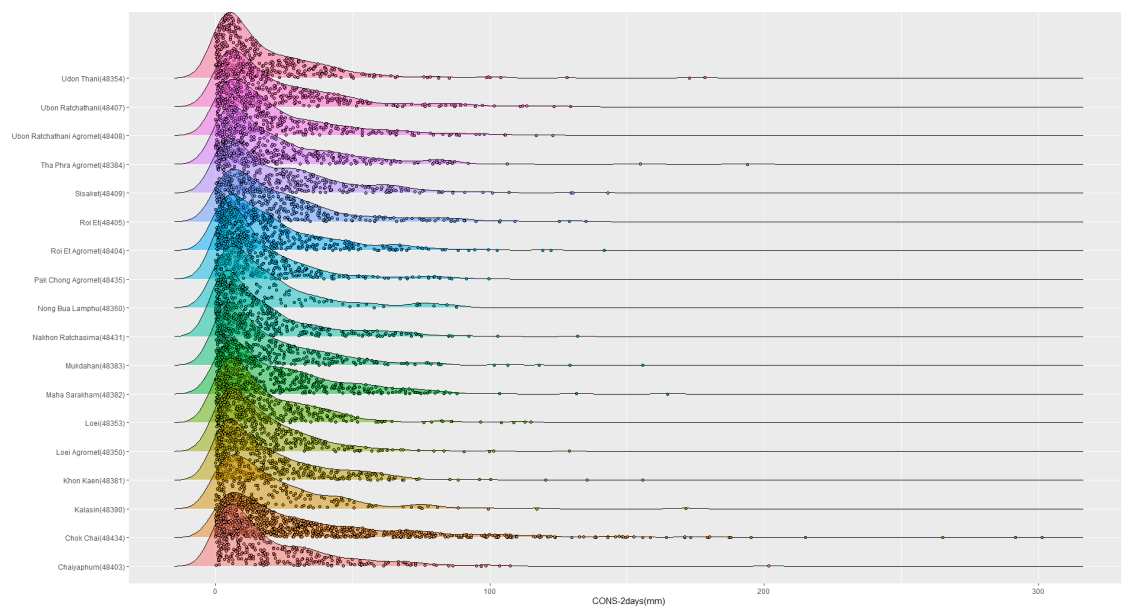


Figure S 7: Density plot of cumulative rainfall on CONS-2 days(mm.) for all stations.

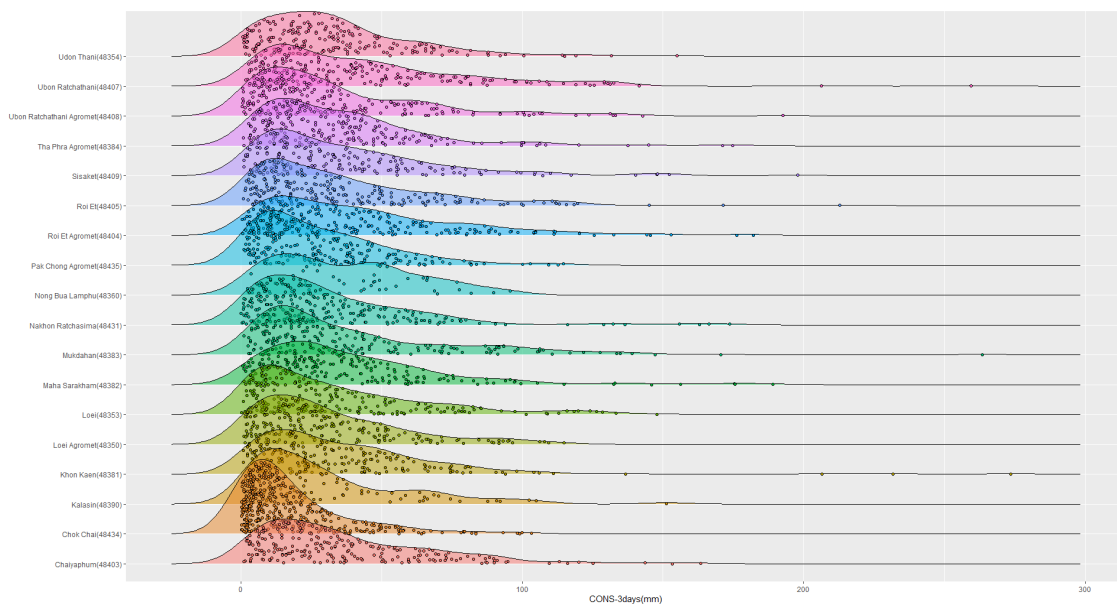


Figure S 8: Density plot of cumulative rainfall on CONS-3 days(mm.) for all stations.

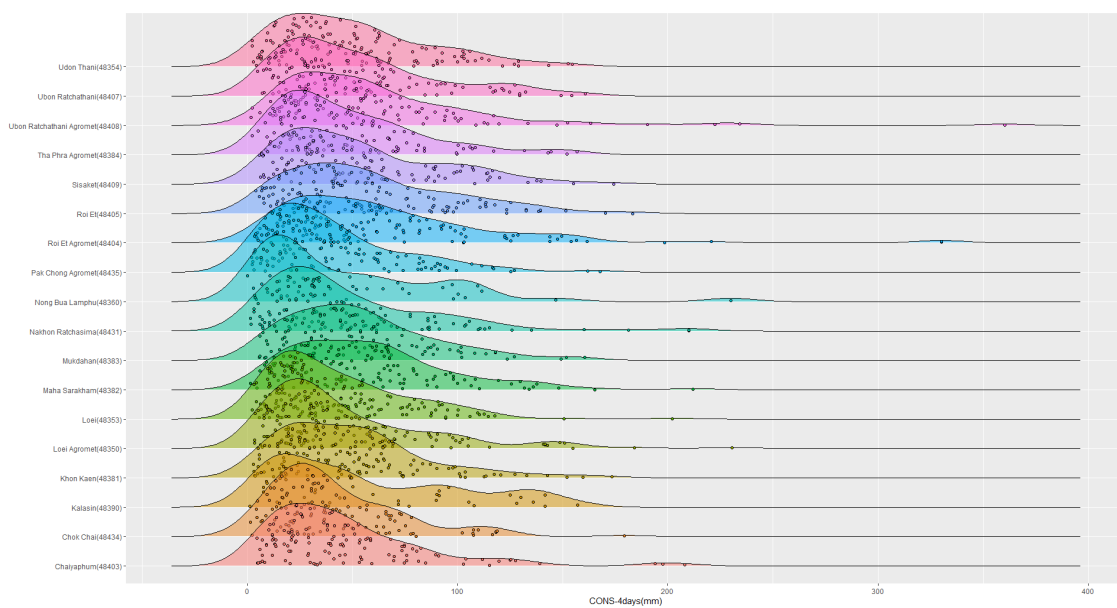


Figure S 9: Density plot of cumulative rainfall on CONS-4 days(mm.) for all stations.

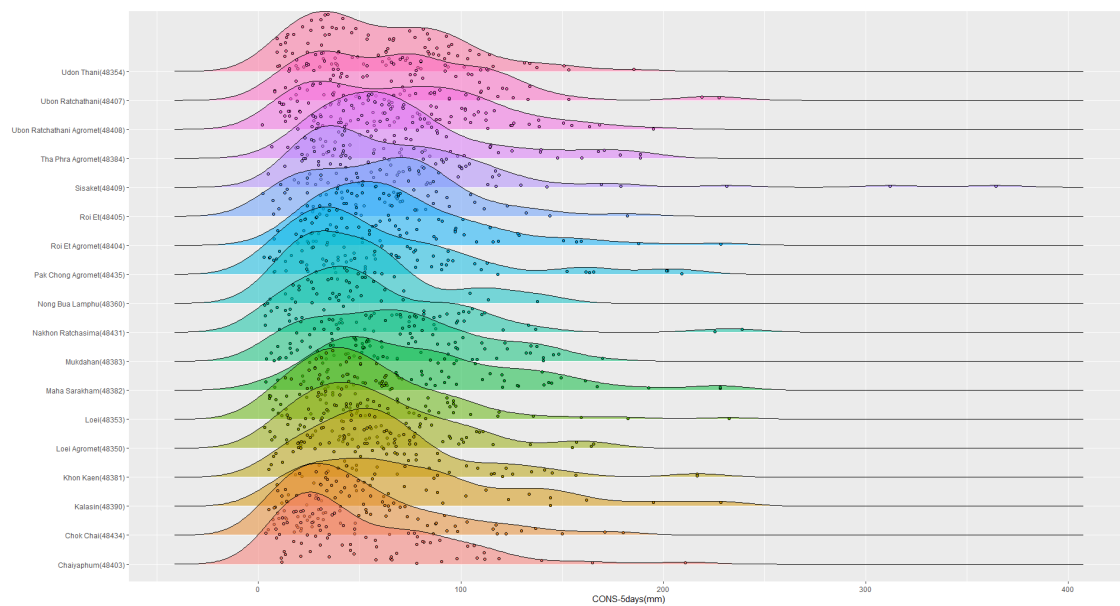


Figure S 10: Density plot of cumulative rainfall on CONS-5 days(mm.) for all stations.

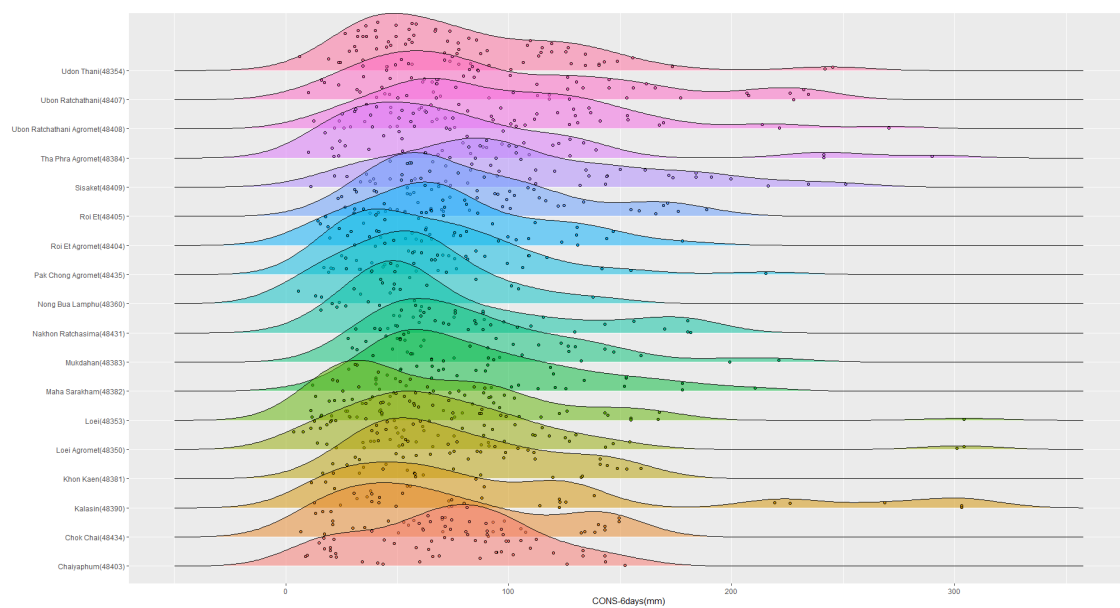


Figure S 11: Density plot of cumulative rainfall on CONS-6 days(mm.) for all stations.

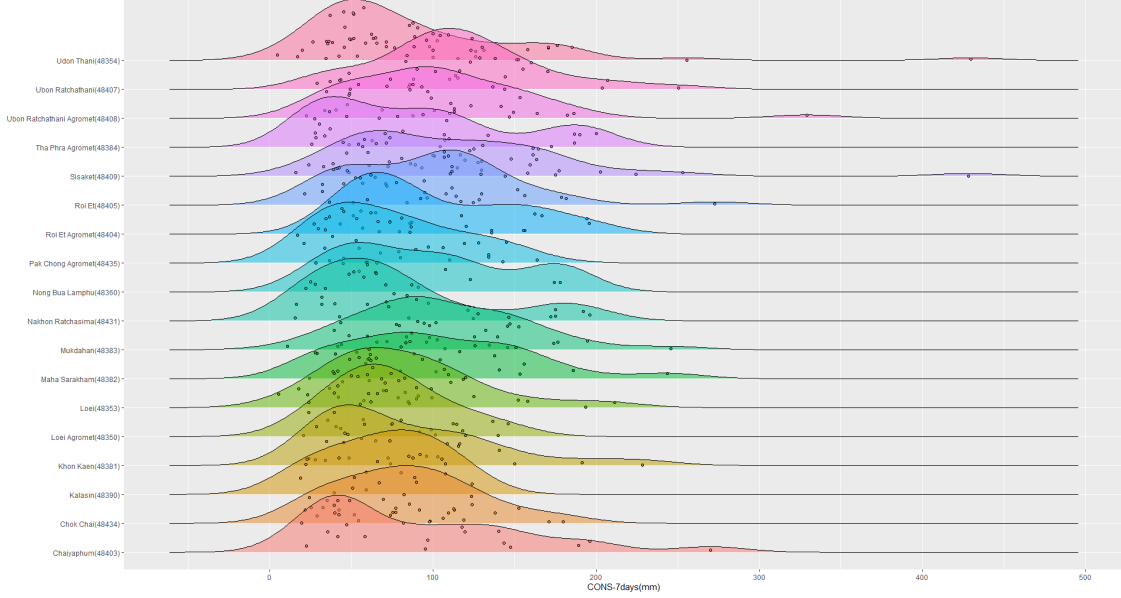


Figure S 12: Density plot of cumulative rainfall on CONS-7 days(mm.) for all stations.

3. Parameter estimation

Table S 26: Parameter estimates and standard error (SE) with thresholds (u), number of exceedances $n_{y_i > u}$, and goodness-of-fit test results(p-values) for the maximum cumulative rainfall of of CONS-2 days for all stations.

Station ID	Model	u	$n_{y_i > u}$	$\sigma(SE)$	$\xi(SE)$	KS(p-value)	AIC
48353	GPD00	42 ^c	36	19.91(6.70)	0.07(0.29)	0.14(0.41)	296.78
48350	GPD00	39 ^b	40	17.53(4.38)	0.06(0.19)	0.08(0.91)	318.41
48354	GPD00	43 ^b	37	18.75(5.76)	0.32(0.26)	0.08(0.95)	319.30
48360	GPD00	35 ^a	18	61.70(0.01)	-1.16(0.01)	0.22(0.27)	138.60
48381	GPD00	50 ^b	39	14.34(3.60)	0.24(0.19)	0.11(0.70)	309.02
48383	GPD00	52 ^b	41	21.19(4.52)	0.08(0.14)	0.11(0.61)	343.31
48384	GPD00	46 ^c	38	20.90(5.33)	0.08(0.19)	0.07(0.97)	317.49
48382	GPD00	55 ^b	44	15.23(3.22)	0.1(0.14)	0.08(0.87)	341.30
48390	GPD00	48 ^b	18	28.06(9.58)	0.01(0.24)	0.12(0.93)	160.65
48403	GPD00	51 ^b	37	19.55(4.48)	0.11(0.16)	0.09(0.90)	306.59
48405	GPD00	50 ^b	40	28.00(5.94)	-0.17(0.14)	0.11(0.63)	336.69
48404	GPD10	57 ^b	37	$\sigma_0 = 3.08(0.001),$ $\sigma_1 = -0.01(0.20)$	0.04(0.40)	0.10(0.77)	297.89
48408	GPD00	57 ^b	40	30.31(6.66)	-0.27(0.15)	0.08(0.93)	335.28
48407	GPD00	54 ^b	34	31.92(7.47)	-0.38(0.17)	0.10(0.87)	281.50
48409	GPD00	53 ^b	37	39.34(8.65)	-0.45(0.16)	0.12(0.63)	316.22
48431	GPD00	48 ^b	44	21.69(4.19)	-0.12(0.12)	0.10(0.74)	351.34
48435	GPD00	37 ^b	42	33.28(6.60)	-0.48(0.14)	0.11(0.64)	341.65
48434	GPD00	80 ^b	94	44.90(6.41)	-0.02(0.09)	0.06(0.86)	902.62

Table S 27: Parameter estimates and standard error (SE) with thresholds (u), number of exceedances $n_{y_i > u}$, and goodness-of-fit test results(p-values) for the maximum cumulative rainfall of of CONS-3 days for all stations.

Station ID	Model	u	$n_{y_i > u}$	$\sigma(SE)$	$\xi(SE)$	KS(p-value)	AIC
48353	GPD00	35 ^a	77	43.28(6.88)	-0.29(6.88)	0.05(0.95)	692.25
48350	GPD00	67 ^b	22	39.80(11.13)	-0.81(11.13)	0.13(0.77)	174.02
48354	GPD20	68 ^b	21	$\sigma_0 = 7.60(0.002),$ $\sigma_1 = -0.06(0.002),$ $\sigma_2 = 0.002(0.20)$	-1.02(0.001)	0.10(0.96)	177.75
48360	GPD00	35 ^a	25	39.32(10.05)	-0.61(10.05)	0.14(0.60)	206.84
48381	GPD00	75 ^b	20	14.22(6.88)	0.81(6.88)	0.10(0.95)	182.65
48383	GPD01	92 ^b	20	73.70(0.01)	$\xi_0 = 4.16(0.02),$ $\xi_1 = -0.03(0.001),$	0.15(0.70)	184.08
48384	GPD00	35 ^a	94	19.99(3.37)	0.19(3.37)	0.04(0.97)	791.30
48382	GPD00	35 ^a	93	29.23(4.50)	0.05(4.50)	0.06(0.82)	827.81
48390	GPD00	67 ^c	10	27.76(13.03)	-0.1(13.03)	0.13(0.97)	88.33
48403	GPD00	35 ^a	94	35.18(4.87)	-0.15(4.87)	0.05(0.94)	832.48
48405	GPD00	35 ^a	86	35.24(5.09)	-0.05(5.09)	0.04(0.99)	778.63
48404	GPD00	35 ^a	106	39.29(5.28)	-0.13(5.28)	0.04(0.98)	965.79
48408	GPD00	72 ^b	22	43.00(11.79)	-0.23(11.79)	0.12(0.84)	202.95
48407	GPD00	35 ^a	101	38.04(5.08)	-0.02(5.08)	0.05(0.93)	936.40
48409	GPD01	35 ^a	76	33.03(5.80)	$\xi_0 = 0.11(0.14),$ $\xi_1 = -0.001(0.002),$	0.04(0.99)	680.32
48431	GPD00	35 ^a	79	26.59(4.49)	0.08(4.49)	0.06(0.85)	694.24
48435	GPD00	50 ^c	41	21.81(5.4)	-0.13(5.4)	0.07(0.98)	327.32
48434	GPD01	35 ^a	63	28.89(5.32)	$\xi_0 = -0.33(0.14),$ $\xi_1 = 0.07(0.002)$	0.11(0.36)	513.78

Table S 28: Parameter estimates and standard error (SE) with thresholds (u), number of exceedances $n_{y_i > u}$, and goodness-of-fit test results(p-values) for the maximum cumulative rainfall of of CONS-4 days for all stations.

Station ID	Model	u	$n_{y_i > u}$	$\sigma(SE)$	$\xi(SE)$	KS(p-value)	AIC
48353	GPD00	90 ^b	16	15.59(6.32)	0.28(0.32)	0.11(0.97)	133.03
48350	GPD00	35 ^a	63	48.24(8.64)	-0.1(0.12)	0.05(0.98)	605.64
48354	GPD00	35 ^a	80	50.83(7.50)	-0.35(0.1)	0.07(0.82)	736.52
48360	GPD00	95 ^c	8	13.72(8.74)	0.63(0.57)	0.15(0.97)	72.03
48381	GPD00	35 ^a	89	40.09(5.75)	-0.16(0.09)	0.08(0.56)	808.90
48384	GPD00	35 ^a	58	47.98(8.87)	-0.28(0.13)	0.07(0.89)	536.42
48383	GPD00	101 ^b	12	32.45(21.14)	-0.42(0.59)	0.23(0.46)	101.28
48382	GPD00	107 ^b	12	37.49(14.90)	-0.18(0.27)	0.16(0.85)	110.60
48390	GPD10	95 ^c	10	$\sigma_0 = 3.95(0.002),$ $\sigma_1 = 0.01(0.001)$	-1.79(0.001)	0.21(0.74)	47.80
48403	GPD00	35 ^a	70	32.14(5.96)	0.08(0.14)	0.06(0.96)	641.85
48405	GPD00	95 ^c	24	35.08(10.02)	-0.27(0.2)	0.09(0.98)	209.46
48404	GPD00	127 ^b	12	51.23(25.56)	0.17(0.41)	0.19(0.74)	126.72
48408	GPD00	92 ^c	20	32.3(13.74)	0.4(0.37)	0.1(0.96)	199.25
48407	GPD00	116 ^b	12	22.13(12.33)	-0.35(0.48)	0.18(0.81)	93.91
48409	GPD00	100 ^c	16	27.11(10.07)	-0.19(0.27)	0.14(0.82)	135.27
48431	GPD00	35 ^a	57	47.97(8.93)	-0.09(0.13)	0.07(0.89)	548.06
48435	GPD00	82 ^c	19	25.18(9.51)	-0.02(0.3)	0.11(0.93)	163.59
48434	GPD00	35 ^a	57	33.76(6.31)	-0.08(0.13)	0.10(0.50)	509.28

Table S 29: Parameter estimates and standard error (SE) with thresholds (u), number of exceedances $n_{y_i > u}$, and goodness-of-fit test results(p-values) for the maximum cumulative rainfall of of CONS-5 days for all stations.

Station ID	Model	u	$n_{y_i > u}$	$\sigma(SE)$	$\xi(SE)$	KS(p-value)	AIC
48353	GPD00	35 ^a	57	39.00(6.95)	-0.02(0.11)	0.10(0.54)	532.47
48350	GPD00	35 ^a	60	46.96(8.66)	-0.21(0.13)	0.05(0.99)	560.02
48354	GPD00	102 ^c	11	39.49(17.9)	-0.34(0.35)	0.13(0.96)	99.27
48360	GPD01	35 ^a	12	3.99(0.002)	$\xi_0 = 4.16(0.02),$ $\xi_1 = -1.19(0.001),$	0.17(0.78)	113.29
48381	GPD00	110 ^c	11	38.80(20.24)	-0.06(0.42)	0.13(0.98)	105.08
48384	GPD00	35 ^a	71	55.52(9.46)	-0.21(0.12)	0.08(0.66)	685.31
48383	GPD00	35 ^a	65	70.91(10.16)	-0.49(0.09)	0.07(0.86)	623.46
48382	GPD01	35 ^a	56	5.01(0.32)	$\xi_0 = -0.02(0.01),$ $\xi_1 = -0.64(0.26),$	0.05(0.99)	565.43
48390	GPD00	35 ^a	25	81.17(21.86)	-0.32(0.19)	0.09(0.97)	257.82
48403	GPD00	90 ^c	11	34.17(16.13)	0.001(0.36)	0.16(0.87)	103.59
48405	GPD00	95 ^c	7	54.05(35.59)	-0.52(0.57)	0.17(0.96)	66.52
48404	GPD00	100 ^c	13	43.30(19.36)	-0.12(0.35)	0.11(0.98)	124.77
48408	GPD00	105 ^c	18	36.08(12.42)	-0.26(0.25)	0.11(0.95)	159.47
48407	GPD00	110 ^c	12	20.21(10.28)	0.38(0.43)	0.12(0.97)	109.47
48409	GPD00	117 ^b	8	109.16(87.68)	-0.21(0.72)	0.17(0.93)	91.63
48431	GPD00	104 ^b	8	27.80(20.10)	0.42(0.64)	0.16(0.95)	79.97
48435	GPD00	35 ^a	54	44.22(9.85)	0.01(0.17)	0.08(0.85)	522.47
48434	GPD00	35 ^a	50	49.18(10.00)	-0.2(0.14)	0.06(0.97)	473.02

Table S 30: Parameter estimates and standard error (SE) with thresholds (u), number of exceedances $n_{y_i > u}$, and goodness-of-fit test results(p-values) for the maximum cumulative rainfall of of CONS-6 days for all stations.

Station ID	Model	u	$n_{y_i > u}$	$\sigma(SE)$	$\xi(SE)$	KS(p-value)	AIC
48353	GPD00	139 ^b .6	7	20.8(12.75)	0.47(0.51)	0.20(0.86)	67.08
48350	GPD00	124 ^b .6	8	16.48(13.54)	1.01(0.82)	0.16(0.96)	81.08
48354	GPD00	35 ^a	59	65.75(11.04)	-0.19(0.1)	0.06(0.97)	592.75
48360	GPD00	97.9 ^b	3	15.93(26.14)	0.03(1.53)	0.33(0.77)	26.81
48381	GPD00	35 ^a	43	87.74(17.32)	-0.68(0.16)	0.1(0.71)	415.81
48384	GPD00	35 ^a	37	57.95(13.61)	-0.006(0.16)	0.1(0.82)	377.92
48383	GPD00	120	10	29.17(16.42)	0.05(0.46)	0.15(0.94)	92.59
48382	GPD00	35 ^a	44	69.29(13.95)	-0.3(0.14)	0.07(0.98)	437.80
48390	GPD00	35 ^a	24	93.26(33.07)	-0.09(0.29)	0.11(0.92)	265.07
48403	GPD10	100 ^c	11	$\sigma_0 = 3.89(0.001)$, $\sigma_1 = 0.002(0.01)$	-1.12(0.001)	0.15(0.96)	83.75
48405	GPD00	35 ^a	53	76.61(14.79)	-0.43(0.14)	0.09(0.75)	523.92
48404	GPD00	110 ^c	8	43.04(24.24)	-0.55(0.48)	0.19(0.88)	71.33
48408	GPD00	125 ^c	15	24.51(12.41)	0.34(0.44)	0.12(0.97)	140.26
48407	GPD00	35 ^a	48	112.83(25.16)	-0.49(0.18)	0.11(0.5)	506.56
48409	GPD00	35 ^a	51	111.47(19.16)	-0.47(0.11)	0.09(0.77)	538.52
48431	GPD00	35 ^a	34	51.35(16.47)	-0.07(0.27)	0.15(0.35)	334.52
48435	GPD00	95 ^c	9	26.23(15.8)	0.2(0.5)	0.15(0.95)	84.47
48434	GPD00	110 ^c	8	100.5(0.01)	-2.53(0.01)	0.28(0.54)	16.15

Table S 31: Parameter estimates and standard error (SE) with thresholds (u), number of exceedances $n_{y_i > u}$, and goodness-of-fit test results(p-values) for the maximum cumulative rainfall of of CONS-7 days for all stations.

Station ID	Model	u	$n_{y_i > u}$	$\sigma(SE)$	$\xi(SE)$	KS(p-value)	AIC
48353	GPD00	35 ^a	35	66.39(15.04)	-0.26(0.15)	0.07(0.98)	348.99
48350	GPD00	35 ^a	32	68.46(16.67)	-0.57(0.19)	0.09(0.87)	301.83
48354	GPD00	35 ^a	43	56.01(13.02)	0.12(0.17)	0.05(0.99)	446.78
48360	GPD00	35 ^a	8	173.71(0.05)	-1.21(0.01)	0.20(0.82)	71.30
48381	GPD00	35 ^a	21	77.06(23.57)	-0.27(0.22)	0.09(0.98)	216.92
48384	GPD00	35 ^a	20	190.763(0.05)	-1.15(0.01)	0.29(0.80)	200.17
48383	GPD00	120 ^c	14	42.03(15.54)	-0.15(0.25)	0.15(0.91)	132.23
48382	GPD00	125 ^c	8	39.01(21.66)	-0.06(0.42)	0.19(0.86)	77.58
48390	GPD00	35 ^a	14	101.36(0.05)	-1.13(0.01)	0.15(0.88)	121.98
48403	GPD00	100 ^c	8	99.93(55.77)	-0.48(0.46)	0.20(0.82)	85.84
48405	GPD00	115 ^c	11	39.16(17.82)	0.04(0.34)	0.14(0.95)	107.59
48404	GPD00	35 ^a	26	115.46(35.08)	-0.68(0.26)	0.16(0.46)	267.45
48408	GPD00	125 ^c	10	43.26(19.15)	0.1(0.31)	0.23(0.57)	101.43
48407	GPD00	140 ^c	8	57.25(34.81)	-0.37(0.51)	0.18(0.90)	78.69
48409	GPD00	176 ^b	5	63.45(53.95)	0.23(0.73)	0.18(0.98)	57.83
48431	GPD00	35 ^a	24	93.87(37.56)	-0.49(0.35)	0.19(0.33)	246.44
48435	GPD00	35 ^a	29	82.64(19.47)	-0.61(0.18)	0.08(0.98)	282.64
48434	GPD00	35 ^a	30	95.19(21.7)	-0.62(0.17)	0.11(0.81)	299.66

Table S 32: Estimated return level in different years of the maximum cumulative rainfall of of CONS-4 days.

Station	2-year	5-year	25-year	50-year	100-year
48353	221.96	277.79	419.26	503.30	605.73
48350	246.73	270.14	306.32	320.18	333.09
48354	162.75	167.51	172.93	174.47	175.68
48360	279.68	346.75	493.89	571.13	658.29
48381	186.93	199.10	216.40	222.51	227.94
48384	173.55	180.86	189.92	192.72	195.03
48383	165.47	169.34	173.35	174.39	175.17
48382	217.91	232.38	252.61	259.65	265.85
48390	157.06	157.15	157.19	157.20	157.20
48403	286.93	338.25	438.78	486.56	537.28
48405	188.60	195.97	205.14	207.99	210.34
48404	457.91	567.03	807.18	933.60	1076.49
48408	600.97	866.48	1655.03	2189.49	2897.85
48407	165.48	169.28	173.60	174.83	175.80
48409	182.08	191.17	203.65	207.91	211.63
48431	248.05	271.69	308.38	322.48	335.65
48435	189.33	209.56	243.94	258.31	272.41
48434	189.66	207.50	235.58	246.51	256.80

Table S 33: Estimated return level in different years of the maximum cumulative rainfall of of CONS-5 days.

Station	2-year	5-year	25-year	50-year	100-year
48353	254.66	284.40	334.84	355.88	376.51
48350	195.84	205.99	219.61	224.17	228.09
48354	191.89	198.51	206.08	208.25	209.96
48360	157.43	161.72	166.50	167.83	168.87
48381	262.41	288.23	330.06	346.79	362.78
48384	225.65	237.08	252.35	257.44	261.81
48383	171.59	173.87	176.06	176.58	176.94
48382	255.54	265.96	279.05	283.15	286.55
48390	254.64	263.25	273.43	276.43	278.84
48403	250.32	280.89	334.27	357.14	379.94
48405	188.17	191.96	195.47	196.27	196.83
48404	258.58	279.19	310.20	321.78	332.40
48408	203.96	211.79	221.65	224.76	227.33
48407	390.25	532.23	943.91	1217.51	1575.59
48409	423.06	459.06	507.39	523.56	537.49
48431	442.52	634.01	1215.69	1617.23	2155.74
48435	316.36	359.89	437.41	471.22	505.27
48434	204.38	216.40	232.73	238.26	243.05

Table S 34: Estimated return level in different years of the maximum cumulative rainfall of CONS-6 days.

Station	2-year	5-year	25-year	50-year	100-year
48353	320.54	349.44	393.99	411.00	426.83
48350	364.71	415.74	507.83	548.47	589.72
48354	274.69	290.35	311.88	319.25	325.68
48360	150.85	154.45	158.43	159.53	160.38
48381	161.38	162.10	162.65	162.76	162.82
48384	395.47	446.19	534.51	572.25	609.82
48383	241.33	251.48	264.49	268.64	272.13
48382	229.60	236.90	245.65	248.26	250.38
48390	479.04	523.32	592.24	618.78	643.61
48403	152.04	152.15	152.19	152.20	152.20
48405	201.09	204.54	208.09	209.00	209.68
48404	184.08	186.89	189.68	190.37	190.87
48408	495.41	658.47	1103.80	1385.48	1742.68
48407	255.04	258.56	261.95	262.76	263.34
48409	259.82	263.61	267.34	268.25	268.91
48431	295.13	322.49	366.03	383.16	399.37
48435	242.90	262.30	291.74	302.82	313.04
48434	149.51	149.57	149.59	149.60	149.60

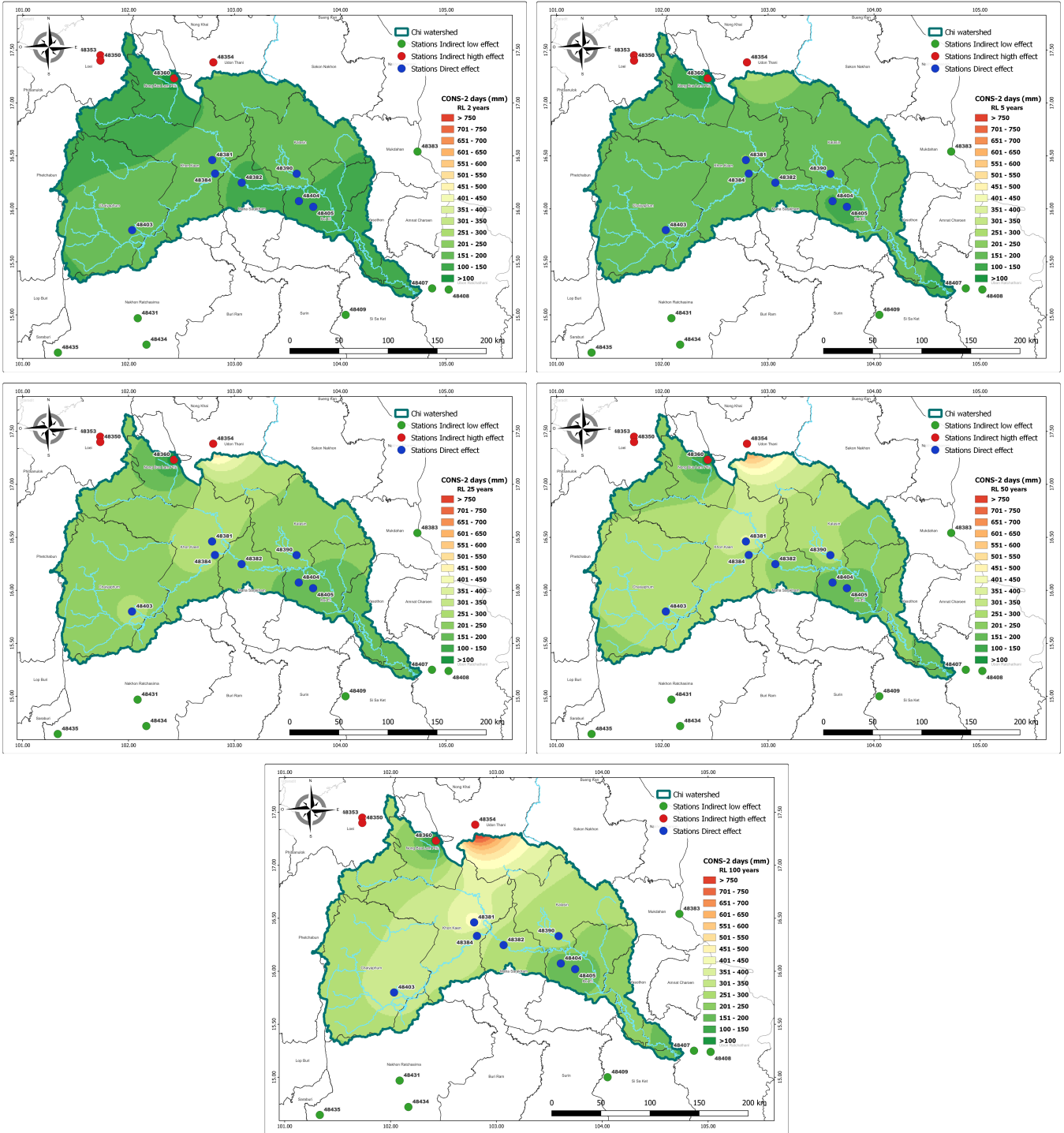


Figure S 13: The estimated return level of maximum cumulative rainfall of consecutive rainy 2-days in the Chi watershed for 2, 5, 25, 50 and 100-year periods.

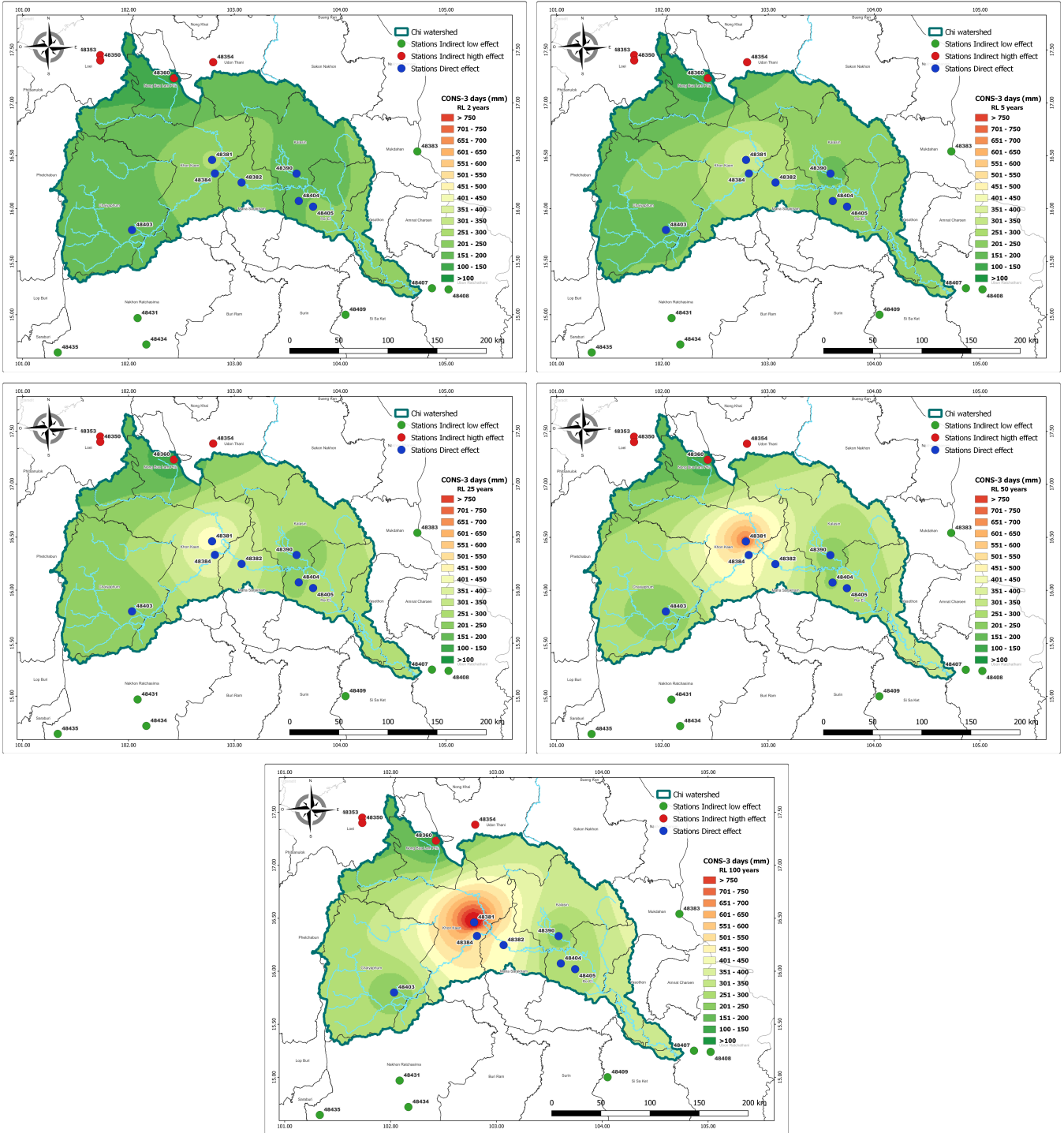


Figure S 14: The estimated return level of maximum cumulative rainfall of consecutive rainy 3-days in the Chi watershed for 2, 5, 25, 50 and 100-year periods.

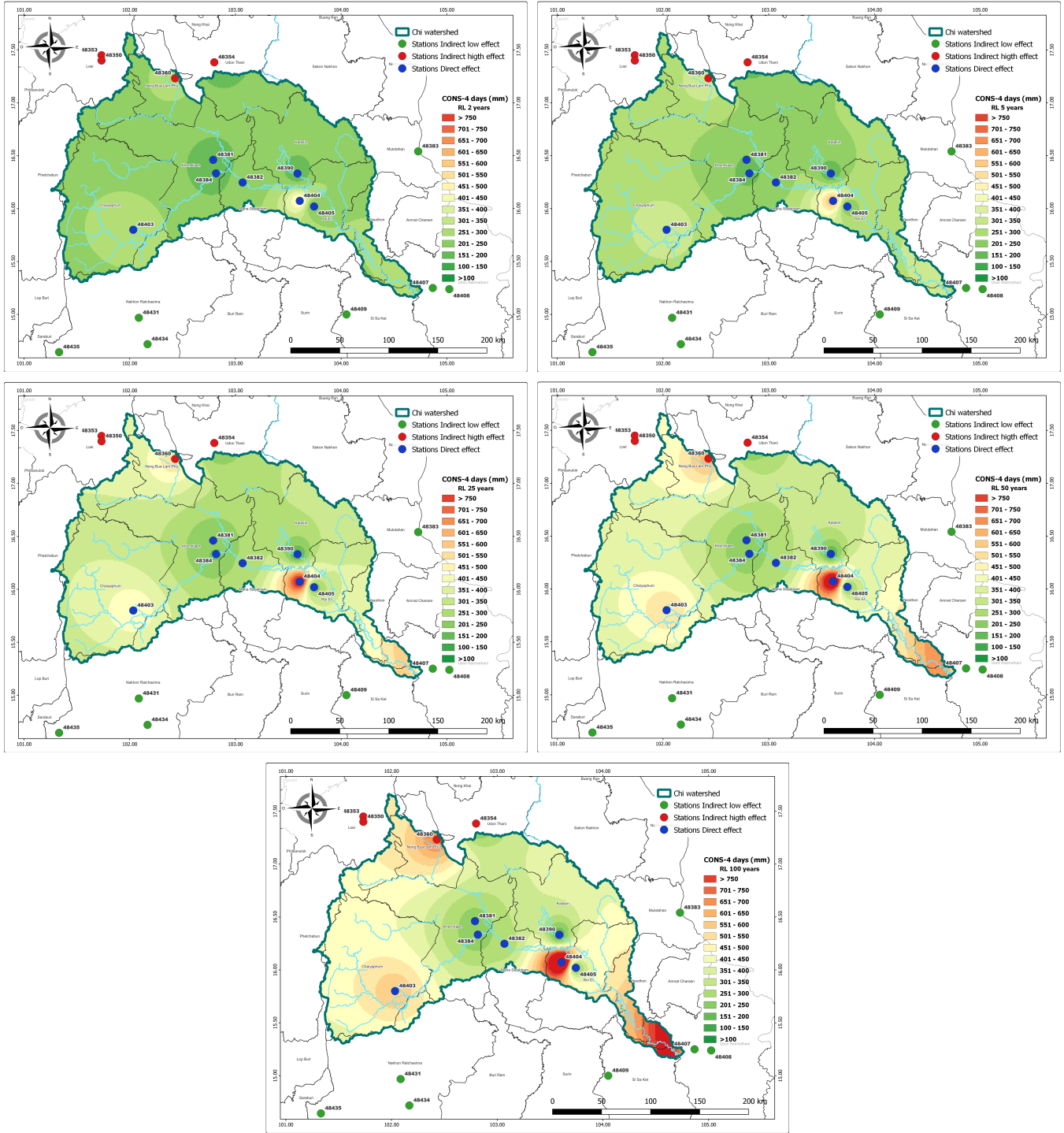


Figure S 15: The estimated return level of maximum cumulative rainfall of consecutive rainy 4-days in the Chi watershed for 2, 5, 25, 50 and 100-year periods.

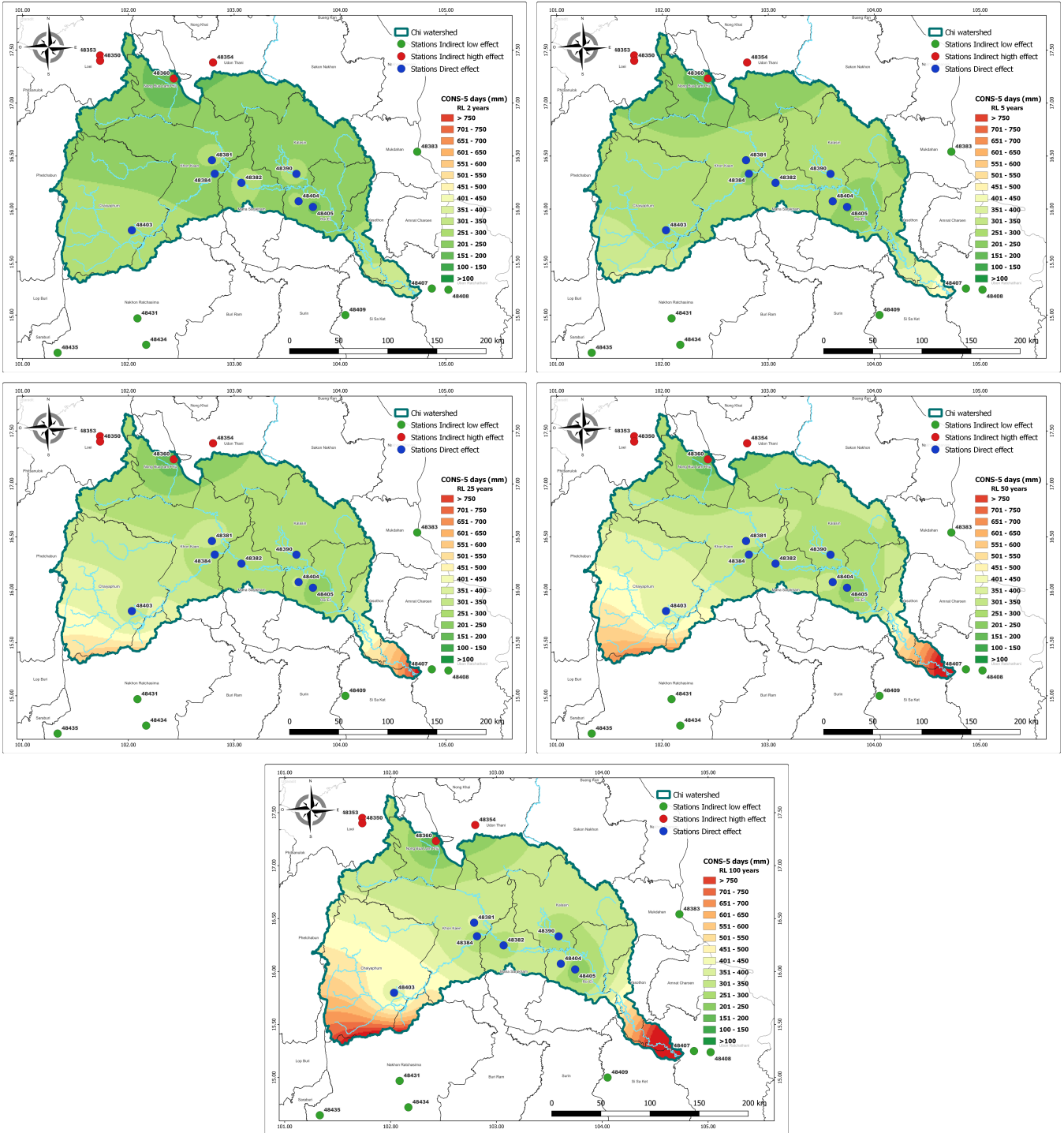


Figure S 16: The estimated return level of maximum cumulative rainfall of consecutive rainy 5-days in the Chi watershed for 2, 5, 25, 50 and 100-year periods.

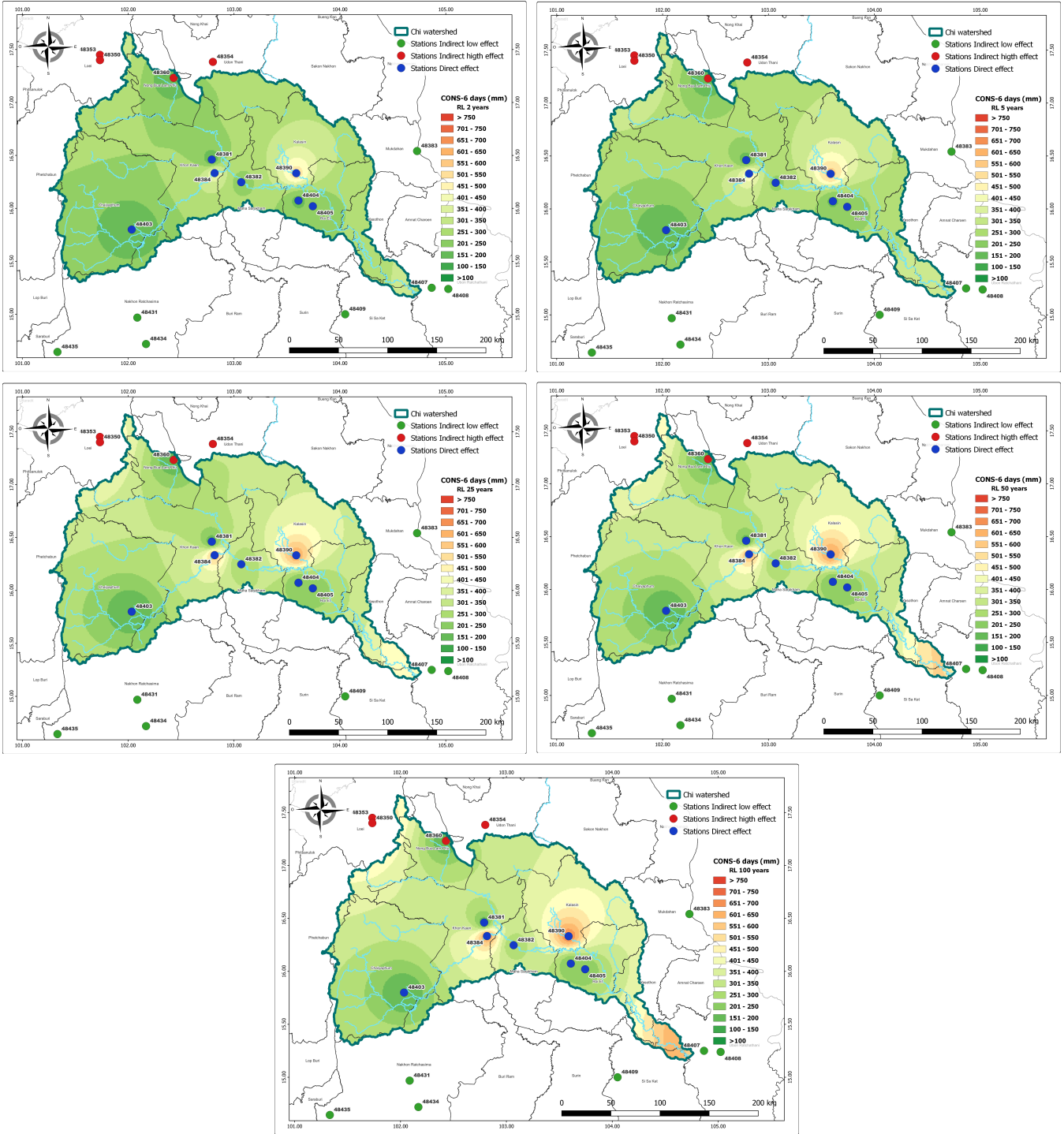


Figure S 17: The estimated return level of maximum cumulative rainfall of consecutive rainy 6-days in the Chi watershed for 2, 5, 25, 50 and 100-year periods.

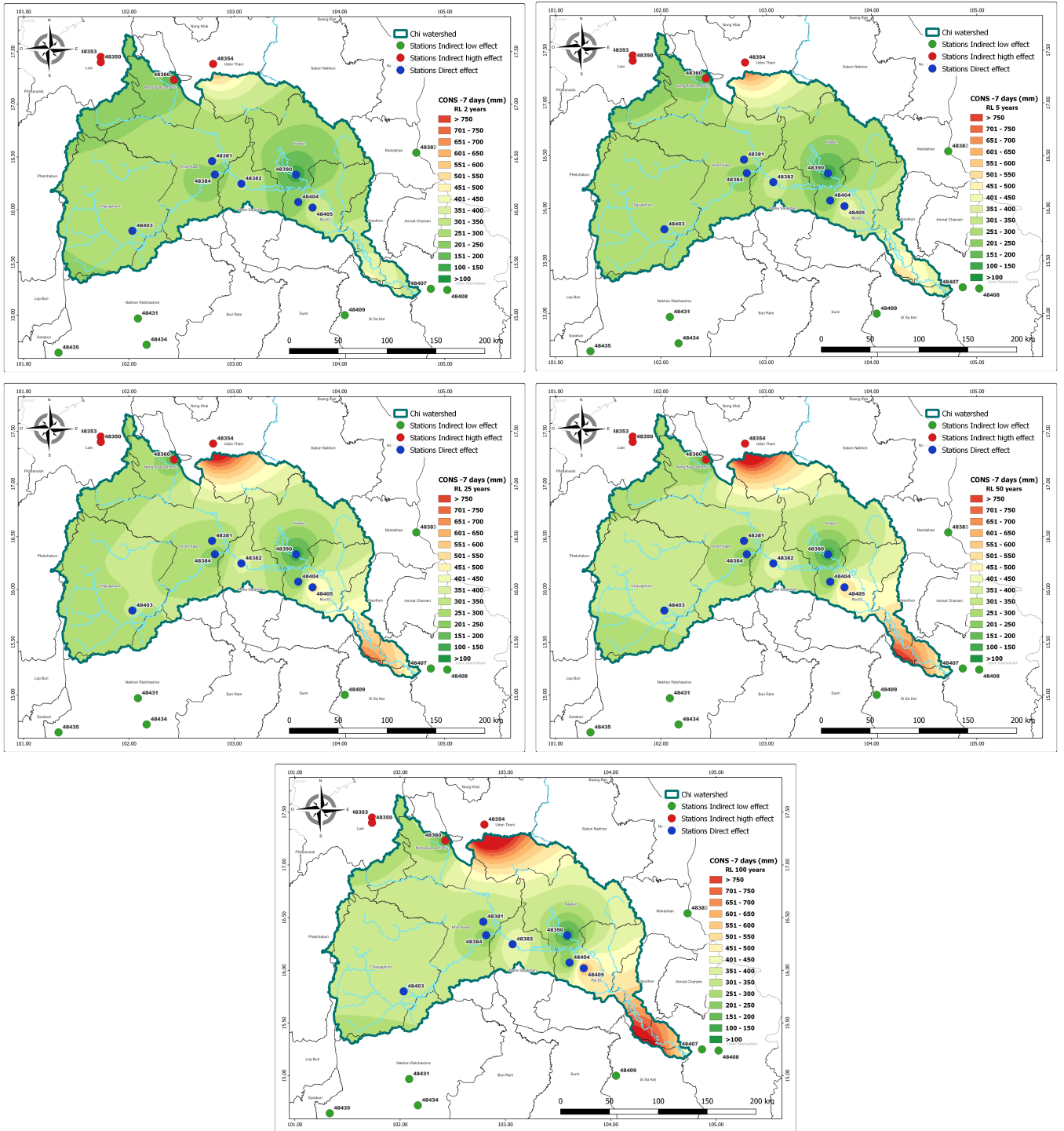


Figure S 18: The estimated return level of maximum cumulative rainfall of consecutive rainy 7-days in the Chi watershed for 2, 5, 25, 50 and 100-year periods.