Flooding

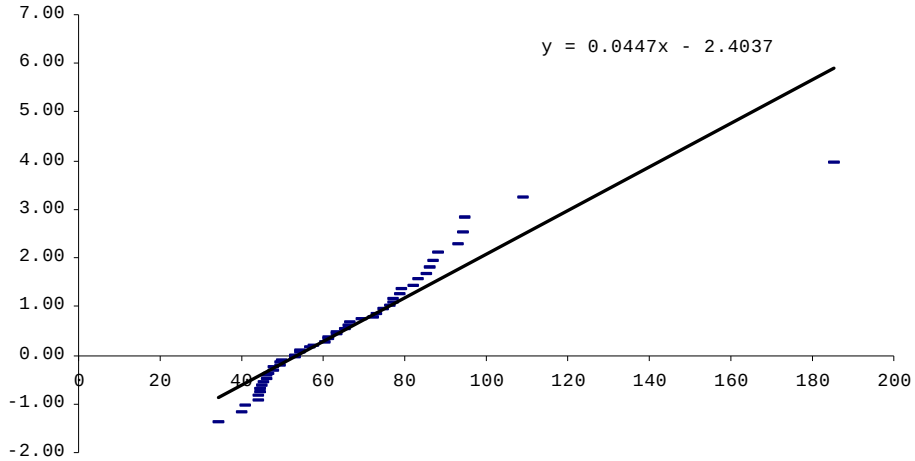
Exercise: Return period/exceeding probability

1. Q50 has a greater probability of occurring during the next 100 yrs (87%) than during the next 5 years (10%).
2. The probability is so low that a flood with return period equal to 500 yrs will occur within the next two years that it is considered as non-existing.

Exercise: Extreme value distribution by Gumbel method

1, 2, 3 and 4:

sorted	rank	left prob	Treturn	y
34.3	1	0.02	1.02	-1.37
39.9	2	0.04	1.04	-1.18
41	3	0.06	1.06	-1.05
44.1	4	0.08	1.08	-0.94
44.2	5	0.10	1.11	-0.85
44.5	6	0.12	1.13	-0.77
44.5	7	0.13	1.16	-0.70
45	8	0.15	1.18	-0.63
45.5	9	0.17	1.21	-0.56
46.2	10	0.19	1.24	-0.50
46.2	11	0.21	1.27	-0.44
46.7	12	0.23	1.30	-0.38
47.8	13	0.25	1.33	-0.33
47.8	14	0.27	1.37	-0.27
49.2	15	0.29	1.41	-0.22
49.4	16	0.31	1.44	-0.16
49.8	17	0.33	1.49	-0.11
53	18	0.35	1.53	-0.06
53.1	19	0.37	1.58	-0.01
54.4	20	0.38	1.63	0.05
54.4	21	0.40	1.68	0.10
56.6	22	0.42	1.73	0.15
57.6	23	0.44	1.79	0.20
60.5	24	0.46	1.86	0.26
61.2	25	0.48	1.93	0.31
61.3	26	0.50	2.00	0.37
63.2	27	0.52	2.08	0.42
63.2	28	0.54	2.17	0.48
65.2	29	0.56	2.26	0.54
66.1	30	0.58	2.36	0.60
66.7	31	0.60	2.48	0.66
69.3	32	0.62	2.60	0.72
72.1	33	0.63	2.74	0.79
73	34	0.65	2.89	0.86
74.5	35	0.67	3.06	0.93
76.2	36	0.69	3.25	1.00
77.2	37	0.71	3.47	1.08
77.3	38	0.73	3.71	1.16
78.7	39	0.75	4.00	1.25
79.2	40	0.77	4.33	1.34
82	41	0.79	4.73	1.44
83.3	42	0.81	5.20	1.54
85.4	43	0.83	5.78	1.66
86	44	0.85	6.50	1.79
87	45	0.87	7.43	1.93
88.3	46	0.88	8.67	2.10
93	47	0.90	10.40	2.29
94.4	48	0.92	13.00	2.53
94.8	49	0.94	17.33	2.82
109	50	0.96	26.00	3.24
185.5	51	0.98	52.00	3.94



plot=y	prob	Tr
5	0.993284702	148.9137
4.8	0.991804025	122.0111
4.6	0.989998515	99.98515
4.4	0.987797719	81.95189
4.2	0.985116297	67.18758
4	0.981851073	55.09968
3.8	0.977877598	45.20305
3.6	0.973046194	37.10051
3.4	0.967177474	30.46688
3.2	0.960057401	25.03593
3	0.951431993	20.58969
2.8	0.941001954	16.94971
2.6	0.928417664	13.96993
2.4	0.913275261	11.53074
2.2	0.895114927	9.534245
2	0.873423018	7.900331
1.8	0.847640317	6.563416
1.6	0.817179487	5.469846
1.4	0.781455585	4.575729
1.2	0.739934055	3.845179
1	0.692200628	3.24887
0.8	0.638056167	2.76286
0.6	0.577635844	2.367625
0.4	0.511544834	2.047271
0.2	0.440991026	1.78888
0	0.367879441	1.581977
-0.2	0.294816321	1.41807
-0.4	0.224961794	1.290259
-0.6	0.161682814	1.192866
-0.8	0.108008978	1.121088
-1	0.065988036	1.07065
-1.2	0.036148605	1.037504
-1.4	0.017332014	1.017638

5: (the values can be calculated precisely)

Rain for Tr = 10 years	104	Tr for rain = 65 mm	2.2
Rain for Tr = 40 years	136	Tr for rain = 80 mm	3.8
Rain for Tr = 100 years	157	Tr for rain = 90 mm	5.6

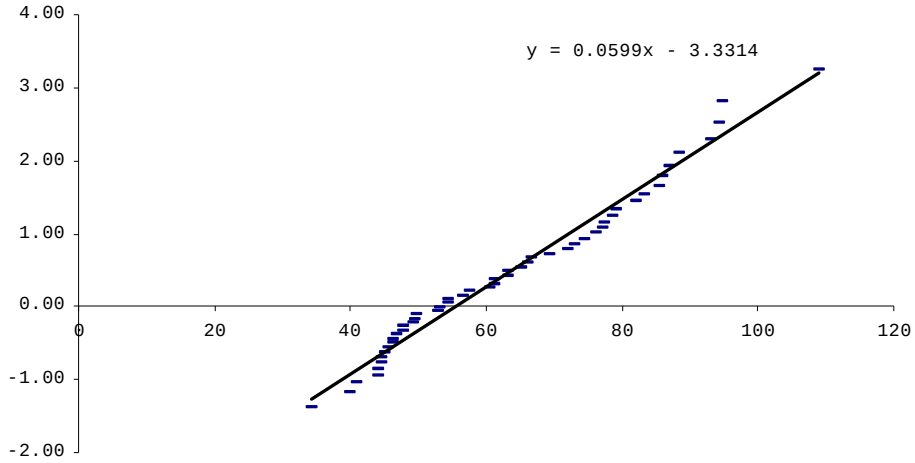
6: Yes, the value of 185.5 mm can be seen as an outlier.

7: An extreme event.

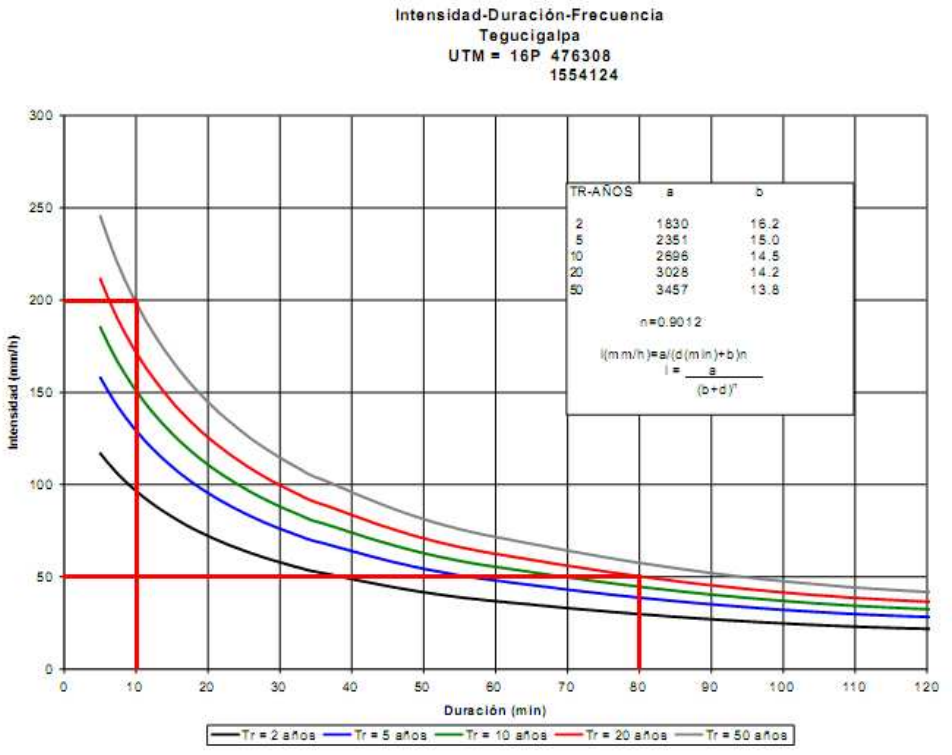
8: It can be "ignored" and then the solution for the linear trend line is: y = 0.0599x - 3.3314.
Then the table would get different values:

Rain for Tr = 10 years	93	Tr for rain = 65 mm	2.3
Rain for Tr = 40 years	117	Tr for rain = 80 mm	4.8
Rain for Tr = 100 years	132	Tr for rain = 90 mm	8.4

These values are probably little more realistic as the outlier is not taken into account and therefore the trend line fits the remaining values better, see figure below.



Exercise: Intensity-duration-frequency relationships



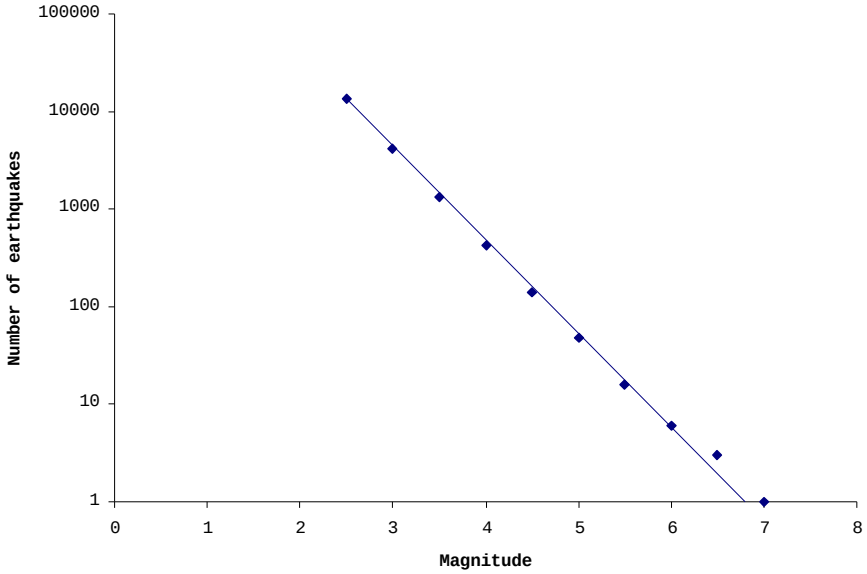
1: The design intensity for a 20-year, 80-minute storm is i = 50 mm/hr. The corresponding precipitation depth is given by P = i * Td with Td = 80 min = 1.333 h. P= i * Td = 50 * 1.333 = 66.65 mm.

2: The design intensity for a 50-year, 10-minute storm is i = 200 mm/hr. The corresponding precipitation depth is given by P = i * Td with Td = 10 min = 0.167 h. P= i * Td = 200 * 0.167 = 33.4 mm.

Earthquakes

Exercise 1

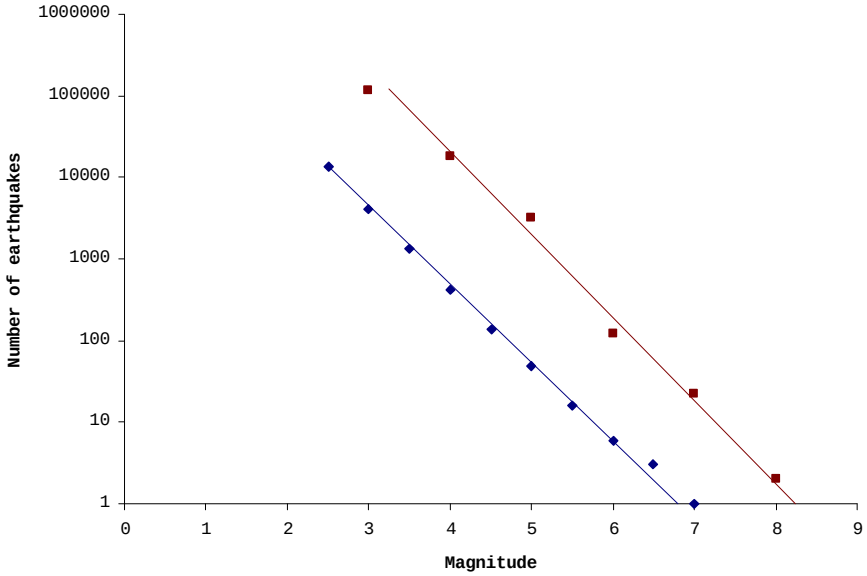
1.1 and 1.2



1.3: The slope of the line is negative.

1.4: Log N(M) = a – bM

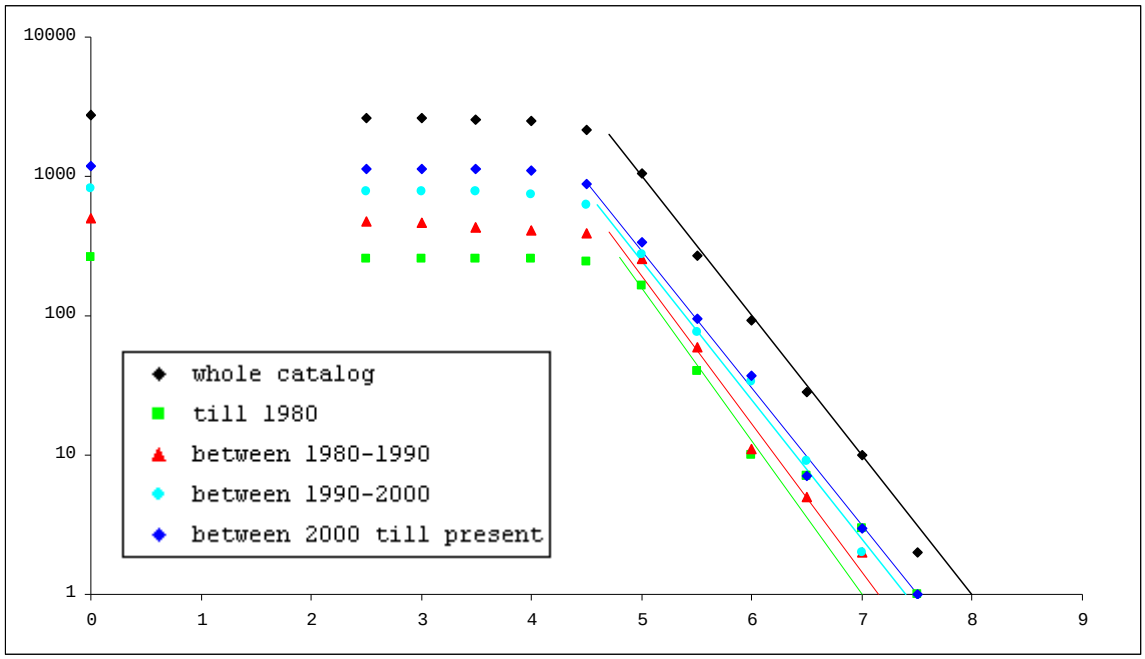
1.5



1.6: The slope is the same. Only the number of earthquakes per magnitude increase (which is logical as a larger area is taken into account).

1.7: The value should be close to 1.

Exercise 2



Do you observe any differences for the various periods (in terms of completeness, overall seismic activity, b values)?
Yes, there are differences between the various periods. Especially the seismic activity shows large differences; it clearly increases with time.