World Applied Sciences Journal 13 (4): 791-797, 2011
ISSN 1818-4952

Investigation of Multi Variable Method for Studying Hydrologic Parameter in Undefined Watershed with Using Flood Index Methods

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Abstract: Due to lack of complete coverage of the network of surface water resources assessment and requires a lot of credit toward establishment, operation, repair and reconstruction of these stations is necessary, using appropriate methods in order to expand and generalize recorded data by stations around No statistics available watershed areas which they have hydrological homogeneity is the radius of action and effect of such information recorded in other regions of interest search. One of the issues that the design of hydraulic structures, plans of reorganization and privacy and the river bed shall difficulty, lack of detailed knowledge of the flood plan is to give the purpose of Hydrologists are various methods for the evaluation of offers to give such values said. Among these methods, using index flood method based on events that occurred in continuous operation shall basin; flood plan can give errors in comparison with other experimental methods to minimize. Flood index method to calculate the mean annual flood event and its relationship with meteorological factors and physiographic characteristics of the main basin is needed. In the present study to evaluate flood with Brgshthay period of hydrometric stations in the basin Bashar (branches of the Karun) and using the Maroon basin stations that climate with Bashar Basin are very similar, compared to nonlinear multivariate relations between me and the average flood basin physiographic characteristics and meteorological factors (annual rainfall, maximum rainfall in 24 hours with different Brgshthay Period area and time of concentration) has been acting and finally analysis of errors occurred in the most appropriate relationship is extracted and presented. Using graphs show the average and the regional flood, flood levels in different parts of the course Brgshthay Non statistics have been calculated. For local stations as well as regional flood levels with different periods Brgshthay calculated with above method and the other values such as flood period Brgshthay diferent stations where observations using numbers and selecting the best statistical distribution is determined and the ratio between the numbers observed calculated for the stations studied in certain areas without flood statistics that show they approach region calculated (depending on the stations which are close to) as the adjustment coefficients and flooding point correction is applied.

Key words: Flood · Index method · The mean annual flood event · Meteorological factors · Characteristics of landforms

INTRODUCTION

For engineering and urban development projects to determine potential flood Seismicity desired location is necessary. In this regard, always ways that do not cost a lot and give good results in different flood periods Brgshthay other words, give or floods with different probabilities offer is considered. Often in places that give the river measurement stations are available using the available statistics can give different floods with return periods using different mathematical analysis can be extracted. In this case, too often implied that the statistical shortcomings of using various methods such as regression relationships with stations having long-term statistics are accurate and complete statistics for these stations can be restored to flood me with a different course from that Brgshthay extracted. In some cases may also be wrong data of this study also can be done in different ways and finally statistics should give sufficient and accurate flood period Brgshthay with various local

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stations can be extracted. In cases where stations may also Hydrometer No statistics have been recorded or the number of years of data of the short is possible to use it for estimating floods with different return periods does not provide. Using models of rainfall - runoff and also to determine the flood estimation in these areas due to lack of data and statistics for a variety of problems faced numerous and reliable results is not achieved. Some of these cases can be extensive catchment area, the lack of access to the severity of statistics - for regional precipitation and subsequent lack of proper rainfall patterns in partial precipitation of less than 24 hours and occurred events based on continuous noted that all of the main factors and the necessary files input models rainfall - runoff are. Also important parameter to determine access and curve number (CN) for various climatic conditions and seasonal and regional problems the other hand, soil moisture earlier days before the precipitation valley region and also not available or is not reliable. Therefore, the amount of CN can be determined precisely not the use of models in total rainfall - runoff as a suitable solution for project needs does not appear. In this case, estimate the flood levels with a lot of complexities that will face this complexity by using analysis of regional index flood method Slab or are solvable. In this study, analyzed on 6 station basin Bashar and 2 blocks from the river basin Maroon has done. First of all physiographic parameters under these two basins basin and meteorological parameters (annual precipitation, maximum precipitation of 24-hour period Brgshthay) has been extracted Regional flood frequency analysis in the relationship between $Q_{2/33}$ and meteorological parameters and physiographic region are provided. The regional flood frequency graph, the relationship between Q_T / $Q_{2/33}$ and T (return period) for the desired region offers with $Q_{2/33}$ anywhere in the area can flood me with a different period for Brgshthay point achieved [1]. In this study for estimating flood me with return periods of 2 / 33 in addition to area under the basin, the basin annual precipitation, maximum rainfall in 24 hours time and concentration of the watershed were also analyzed and finally using a 3 multivariate equation for the relationship give estimates with return periods of 2 / 33 in the region is presented. Continued to scrutinize the calculated values of floods in areas without Maraz regional analysis for the regional stations using the same method, different amounts of Brgshthay flood period and the ratio between the numbers observed (floods obtained from data analysis real) and calculate the (regional approach) these particular stations and areas without flood statistics that show they approach region calculated (depending on the stations which are close to) as the adjustment and correction coefficients floods point acts has been.

Background Research: Floods in many regional studies have been done. Here briefly mention two of these studies are mentioned. In 1996 Mr. Fath Ali Riahi regional flood analysis in the areas of watershed Dez, Karoon, Maroon (Jarahi) and Venus (Hendijan) has done [2]. In this study, 36 stations that had at Least 10 years are statistically chosen 40 year period as a period of statistical indicators in this study have been considered. Provided with the equation for 2-year return period in the study as the mean annual flood event is considered to be as follows:

$$Q_2 = 2/79\, A^{0/466} \quad (1)$$

However, regional analysis should $Q_{2/33}$ as mean annual flood event be considered because the distribution used in this method of distribution should be Gambel $Q_{2/33}$, the mean annual flood event is. In a study conducted by Riahi for providing regional flood frequency relationship of the various distributions has been used in different stations or in other words the best distribution for each station has. If a regional approach for all stations to be integrated Gambel distribution is employed and all floods with different Brgtshhay period for stations in regional analysis with the criteria put Gambel distribution must be extracted. Regional flood equations in this study as well as the relationship (2) are presented. Of course, as is usually the best relationship is logarithmic, but in this study, as mentioned, because for lactations uniformly distributed Gambel not used, the relationship can be the best relationship is presented.

$$\frac{Q_T}{Q_2} = 0/889\, T^{0/37} \quad (2)$$

Yen give very extensive research basins have been considered that the climate conditions are not quite the same and seem unlikely to be a regional analysis in this area and this expansion would work. In 2004 Fatih Toploglu irrigation master section Faculty of Agriculture Cukurova University in Turkey, a regional flood analysis for the basin 4 in the Eastern Mediterranean Region has done that in this basin include Hatay, Seyhan, TEM and Ceyhan. The hydrometric station 50 4 basin statistics and values of the flooding analysis have been.

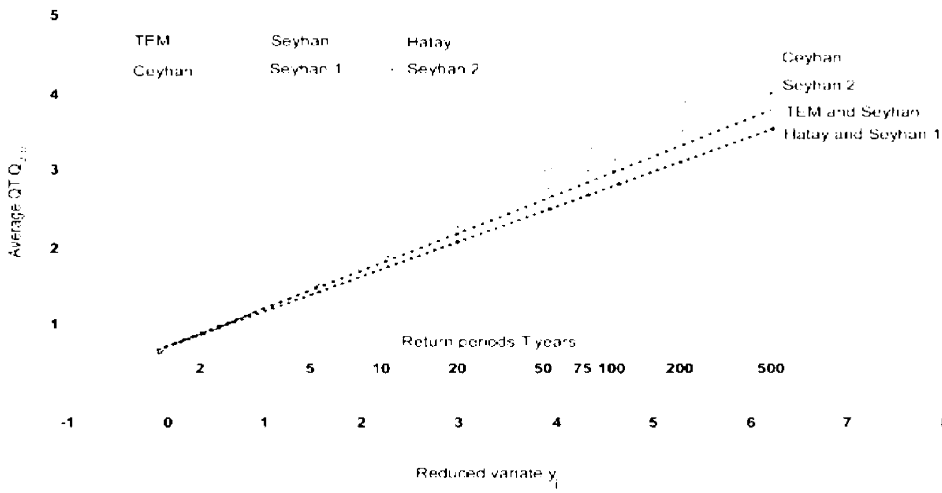


Chart 1: Chart provided for a regional flood basin 4 in the Eastern Mediterranean Region 3

Table 1: Can be seen in the Seyhan basin because regression coefficients of the lower basin

Name of parsel	Regration.eq	R^2
TEM	$Q_{2.33}$=2.52$A^{0.61}$	0.479
Halty	$Q_{2.33}$=5.2$A^{0.422}$	0.790
Seyhan	$Q_{2.33}$=0.585$A^{0.727}$	0.740
Seyhan 1	$Q_{2.33}$=0.0019$A^{1.24}$	0.640
Seyhan	$Q_{2.33}$=0.487$A^{0.8}$	0.590

For ach basin a regional relationship for $Q_{2/33}$ and a regional flood diagram is presented separately. Wayne basin is not integrated with each other, which also seems logical? Noteworthy in this study is that the distribution used in this study to estimate the flood period Brgshthay Mkhltf at different stations, the distribution is Gambel [3]. In most overseas research bodies in the field of regional flood has been done can be seen that the point distribution as a distribution base Gambel goes to work while the majority of the research done within the country and a sample of They mention this important and attention is not a distribution for each station separately, which subject is best for its distribution to stations is used. In this study Dalrympl homogeneity test was performed and the basin TEM and a basin station Ceyhan, two stations were due to Ngrftn acceptable range of statistical analysis, floods have been removed. Another point to be hesitant in this research is that in this study to estimate the $Q_{2.33}$ 4 triple basin area only parameter considered was the same as in Table (1) is observed, regression coefficients of these equations down be. Use of other factors, these coefficients will certainly increase. Table (1) Relations provided for in the regression coefficients $Q_{2.33}$ and 4 triple basins is presented.

Was separated into two parts, ie 2 Seyhan Seyhan 1 and regression coefficients divided and it also has increased. Figure (1) the graph 4 regional flood basin is presented.

In Flood Frequency Analysis Point Where Hydrometric Stations: As mentioned above, the basin was Bashar 6 stations and 2 stations because of the Maroon basin have data of sufficient number of cases have been analyzed using regression relationships between the statistics show the average annual and maximum annual show and give you maximum moment and the annual selection of the best relationships, the moment of maximum statistics for the period of index stations 32 years from 51-1350 to 82-1381 have been lengthening. Bzkr is necessary that the maximum allowed for a prolongation of the year according to the following formula can be calculated [4]:

$$N_E = N/ (1+ ((N-n)/ (n-2)) (1-r^{2}) \quad (3)$$

In this Formula:

- N_E : Time allowed for prolongation Statistics (years).
- n : number of years of data of stations with short-term statistics N: number of years of data of.
- r : Correlation coefficient between the base station and the desired station Stats maximum moment discharge area stations using software SDP (Statistical Distribution Program) was analyzed and the frequency of maximum discharge for a moment the different return periods based on selected statistical distribution has been estimated. Results in Table (2) are presented. Distribution

Used in this analysis are: normal, 2 and 3 parameter log normal, log Pearson and Pearson Type 3 and Gambel based on the lowest standard error, the appropriate distribution for each series of floods that have been selected. Of course Bzkr necessary that the best distribution stations, distribution Gambel is not in the analysis of regional distribution Gambel for these stations is used and data Table (2) In fact, the most accurate prediction for flood stations are listed phase correction that resulted from flooding method to determine the regional flood correction coefficient for each point is used. But for use in regional flood frequency analysis only Gambel distribution is considered.

Uniformity Test Data Flood: Regional analysis to ensure homogeneity of data floods the stations should Dalrympl test be done on these values. In order to achieve this goal first period show flood Brgshthay Gambel distribution for different stations studied using the SDP software were determined and compared me with return periods of 10 years to give Gambel distribution with return periods of 2. 33 (average Give floods Gambel distribution) achieved, then the mean ratios calculated from the average product ratios with return periods of floods give 2. 33 show values corrected floods with return periods of 10 years each station has been calculated. These figures correspond to return periods for each station, give return periods are called uniform. Then points to each station coordinates courses give back in uniform against the effective period of the statistical (TE) on the chart is drawn Dalrympl [5]. Figures mentioned in Table (3) are presented. Using the concept of effective course based on the statistical relation with the aim to eliminate or incorporate stations in regional flood analysis is done and by definition, the relation (4) statistical count period at each station plus half the statistical period prolongation by for the same stations are [6]:

$$T_E = n + (N-n)/2 \qquad (4)$$

N : Period of statistical Indicators, n: number of years observed

Regional Relationships Flood Watersheds and Watershed Maroon Bashar Using Multivariate Mathematical Relations: After the flood control data uniformity in the region to show the relationship between the average T-year floods with return periods of floods with return periods to give 2/33 for different return periods

Table 2: Discharge for different watershed with different period

Type of disstribiution	Time duration 1000	500	200	100	50	25	10	5	2	Area (km^2)	Station	River
Log perison	17486	14717	11507	9390	7581	5869	3997	2758	1394.6	3820	Behbahan	Maroon
Log perison	10383	8978	7293	6140	5058	4119	2665	2169	1175.0	2761	Eedak	Maroon
Gambel	2436	2239	1979	1782	1584	1384	1115	903	581.5	2700	Patareh	Basher
Perison 3	2602	2451	2243	2078	1903	1715	1440	1198	776.7	2421	Betari	Basher
Gambel	1820	1668	14611	1303	1145	986	772	602	364.0	1495	Darshahi	Basher
Gambel	1698	1556	1369	1227	1085	942	748	595	364.0	1077	Shah mokhtar	Basher
Gambel	1271	1163	1021	913	804	697	547	430	254.0	684	Batai-keyk	Basher
Log normal	195	161	123	98	78	59	39	26	12.9	123	Pol kro kiian	Basher

Table 3: Results of uniformity test at hydrometric station of chosen sub watershed of basher and maroon

Effective duration statistics	Number of years	Time duration for uniform (year)	Q2.33* average relative	Q10/q2.33	Time duration		Station	River
30	26	8.0	3844	2.2	4279	1961	Behbahan	Maroon
34	34	8.0	2988	2.1	3174	1524	Eedak	Maroon
33	32	10.5	798	1.8	748	407	Patareh	Basher
24	13	8.0	36	2.1	40	18	Betari	Basher
33	31	10.5	1257	1.7	1116	641	Darshahi	Basher
24	13	9.5	772	2.0	772	394	Shah mokhtar	Basher
22	9	9.5	1626	1.8	1529	830	Batai-keyk	Basher
31	28	10.0	562	1.9	547	287	Pol kro kiian	Basher

Table 4: Hydrological parameters of stasis tics of basher and maroon watershed

Concentration time	Annual average rain fall	Average of maximum daily rain fall	q2.33	A (km^2)	Station	River
17	768	81	1961	3820	Behbahan	Maroon
11	816	81	1524	2761	Eedak	Maroon
7.6	864	85	407	1076	Patareh	Basher
1.7	686	65	19	122	Betari	Basher
13	801	76	641	2699	Darshahi	Basher
11	819	80	394	1495	Shah mokhtar	Basher
11.2	826	78	829	2420	Batai-keyk	Basher
8.2	824	81	287	683	Pol kro kiian	Basher

Table 5: local coefficient formula at Bashar and Mared basin

MSE	R^2	θ	γ	β	α	a	Parameters
0.118	0.951	-	-	-	1.2626	0.05	A
0.077	0.974	-	-	3.835	1.0712	1.102*10-8	AB
0.127	0.956	-	-	0.1.833	1.197	3.8*10-7	AC
0.127	0.956	-	-	0.58	0.9129	0.179	AD
0.064	0.983	-	-4.325	7.353	1.0534	9.8*10-3	ABC
0.0928	0.975	-	-0.286	4.383	1.227	5.813*10-10	ABD
0.153	0.958	-	0.398	1.254	0.975	3.754*10-5	ACD
0.078	0.974	-0.3955	-4.51	8.26	1.255	3.597*10-4	ABCD

In which:

a = constant coefficient, A = area (square kilometer), B= Average of maximum daily rain fall

C = Annual average rain fall, D = Concentration time, MSE= mean squre error, R^2=regression square coefficient

Gambel distribution, stations were established or studied in other words, values floods and no later than the average of the whole basin has been. Results in Figure (3) is presented. Using this graph, which charts the regional flood is known for having me and floods with return periods of 2/33 years can be anywhere in the basin show different Brgshthay flood period can be calculated [6]. To obtain flood me with return periods of 2/33 years and used multivariate relationships just is not enough to cause an area in which this research further on this issue has been emphasized. What regional relationships is considered in multivariate flood the use of hydro climatic and physical factors watersheds watershed, Maroon and Bashar is intended for estimating flood intervals. These factors include long-term average annual precipitation, average maximum daily precipitation in watersheds upstream watershed hydrometric stations and physical parameters such as area and time of concentration are the watersheds above the basin is estimated at 8 and Table (4) is presented. The general equation for the selected region is:

$$Q_{2/33} = \alpha.A^{\alpha}.B^{\beta}.C^{\gamma}.D^{\theta} \quad (5)$$

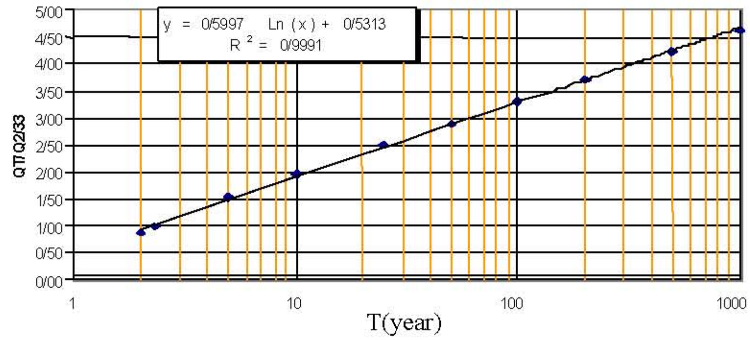
In which a constant coefficient, A is watershed area (kilometers), B average maximum daily rainfall (mm), C mean annual precipitation (mm) and D watersheds watershed time of concentration (h). Using software features Stat graph version 1 / 5 under Windows all multivariate equations governing the above parameters we estimated the values of coefficients of this equation with correlation coefficient square (R^2) and the average standard error (MSE) for each, Table (5) is presented. The basis of relations between the highest R2 and lowest MSE, multivariate.

Relationship for flood watersheds and watershed Maroon Bashar was extracted as follows:

$$Q_{2/33} = 9/8*10^{-3}.(A)^{1/0534}.(B)^{7/353}.(C)^{-4/325}\ R^2 = 0/97 \quad (6)$$

In this Regard: $Q_{2/33}$ = discharge floods with return periods of 33 / 2 Gambel distribution by cubic meter per second A = drainage area watersheds according to square kilometers, B = average maximum daily rainfall in mm watershed watersheds C = average annual precipitation in mm watershed watersheds.

As the Table (5) is characterized with rising effective parameters determining the average annual event correlation gone up or in other words, the parameter estimation error decreases. The Table (5) is characterized.



Graph 2: Local regression formula of basher and maroon basin

Table 6: Hydrological parameter of bashar watershed

Name-basin	No	Name of reach	Code of brief name	Station	Area (km^2)	UTM X	UTM Y	Annual average rain	Max daily average rain
Bashar	1	Bashar 1	A1	Start	709.7	3390594	556875	879.4	87.4
				End	734.1	3393023	551385	878.0	87.0
	2	Sar-aptaveh	A2	Start	73.2	3387982	553913	951.3	89.1
				End	162.1	3393023	551385	932.6	85.6
	3	Bashar 2	A3	Start	896.0	3393023	551385	887.9	86.7
				End	912.2	3394171	550624	886.2	86.4
	4	Mehrian	A4	Start	132.1	3395833	554052	736.2	72.3
				End	137.3	3394171	550624	737.1	72.2
	5	Bashar 3	A5	Start (shah station)	1074.6	3394562	550215	864.7	84.4
				End	1268.3	3407538	538275	838.6	81.9
	6	Krick	A6	Start	116.2	3410573	543359	686.4	65.3
				Krick station	122/6.0	3409273	541155	686/5.0	65/2.0
				End	130.9	3407538	538275	685.2	65.0
	7	Bashar 4	A7	Start	1399.2	3407538	538275	824.3	80.3
				Darshahi station	1495.0	3409827	536558	819.4	80.0
				End	1547.5	3414092	532334	812.5	79.3
	8	Kabkian	A8	Start	619.9	3402482	530564	952.0	82.6
				Kabkian station	683.7	3411177	530781	823.6	80.8
				End	873.1	3414092	532334	852.6	75.9
	9	Bashar 5	A9	Start (bashar botari station)	2420.9	3414517	532215	826.9	78.1
				Pataveh staion	2699.8	3423691	524886	801.2	75.6
				End	2737.1	3425907	524819	798.1	75.3

Table 7: Discharge of Bashar sub watershed (m^3/s)

Name	No	Name of reach	Code of brief name	Station	2	5	10	25	50	100	200	500	1000
Bashar	1	Bashar 1	A1	Start	281.0	463.1	580.3	732.8	841.4	945.5	1059.6	1210.2	1324.0
				End	282.3	465.1	582.8	736.1	845.2	949.7	1064.3	1215.6	1329.9
	2	Sar-aptaveh	A2	Start	21.1	34.7	43.5	54.9	63.1	70.9	79.4	90.7	99.2
				End	39.5	65.0	81.5	102.9	118.2	132.8	148.8	170.0	186.0
	3	Bshar 2	A3	Start	321.5	529.8	663.9	838.4	962.7	1081.7	1212.3	1384.6	1514.8
				End	336.2	553.9	694.1	876.6	1006.5	1142.0	1270.0	1447.6	1583.7
	4	Mehrian	A4	Start	25.6	42.1	52.8	66.7	76.6	86.1	96.4	110.1	120.5
				End	26.2	43.2	54.2	68.4	78.6	88.3	100.5	113.0	123.6
	5	Bashar 3	A5	Strart (shah station	364.2	595.4	748.4	941.8	1085.3	1227.7	1369.6	1556.8	1698.3
				End	393.5	648.3	751.0	954.0	1108.0	1244.0	1376.0	1565.0	1703.0
	6	Krick	A6	Start	12.5	25.4	37.4	57.0	74.4	95.1	118.9	155.8	189.2
				Krick station	12.9	26.4	38.7	58.7	76.9	98.1	122.8	161.2	195.2
				End	13.8	28.1	41.4	63.0	82.3	105.1	131.4	172.2	209.1
	7	Bashar 4	A7	Start	325.7	567.1	762.0	982.0	1140.0	1275.0	1410.0	1640.0	1719.1
				Darshahi station)	364.2	602.5	772.1	986.5	1145.6	1303.4	1460.7	1668.2	1825.0
				End	350.1	609.7	850.0	998.9	1160.6	1319.9	1479.2	1689.4	1835.0
	8	Kabkian	A8	Start	143.7	243.7	309.8	395.8	455.8	518.4	581.0	657.6	719.4
				Kabkian station	254.2	430.5	547.3	694.7	804.2	912.8	1021.0	1163.8	1271.7
				End	262.3	445.1	596.0	722.8	832.4	946.6	1060.9	1200.8	1300.0
	9	Bashar 5	A9	Start (bashar botari station	776.7	1198.4	1440.6	1715.8	1903.0	2078.0	2243.7	2451.6	2602.3
				Pataveh staion	581.5	903.0	1115.8	1384.7	1584.1	1782.1	1979.4	2239.7	2436.4
				End	579.7	898.5	1114.0	1381.3	1583.8	1777.1	1972.0	2235.0	2430.0

Determination and Correction Values Brgshthay Flood Periods in Different Parts of Bashar No Statistics Basin Using Regional Flood: After multivariate equation to determine the flood, with unknown parameters to be basin area, average rainfall Maximum daily and average annual rainfall, flood levels with return periods of 2.33 points in the location of stations and lack of statistics is calculated. The other hand, being unknown to the average regional QT / Q 2 / 33 in each course back in the chart number (4) the amounts of T-year return period flood (from 2 till 1000 year) for all points and no statistics estimated Therefore, calculation figures well with the flood period is achieved by different Brgshthay. On the other hand regional hydrometric stations with different values Brgshthay flood periods are determined based on the flood have been observed (Table 2). In order to scrutinize the resulting flood levels in areas lacking statistics, floods values calculated from the multivariate relationship between regional stations for the region and for different periods of Brgshthay ratio observed between cultivars and adjustment and correction coefficient calculation as well flooding in parts of the region lacks statistics has been considered. Finally, by applying adjustment coefficient at any point, depending on the point to which station is closer, with flood levels in the course of Brgshthay points are calculated. Table (6) Coordinate and profile parts without statistics to determine the flood basin that Bashar has been looking for them and hydrometric stations, watersheds and watershed Maroon Bashar shows. Flood levels for various periods Brgshthay hydrometric stations and points in the watershed areas in Table Bashar (7) are presented.

CONCLUSION

According to studies and studies in this research can be important in relation to 3 results using regional flood frequency analysis to estimate values in areas without flood statistics pointed out:

- To estimate the mean annual flood event ($Q_{2/33}$), which factors in the index flood method is, in places no Statistics should be the maximum operating parameters involved in the search and go nonlinear multivariate Relationships rather than relationship variables used. Of course, I should note that this factor should be sensitive to various parameters will be determined by statistical analysis and parameters are defined and most effective Radarnd multi-variable relations which have the lowest error for estimating $Q_{2/33}$ be used. Table Number (5) is determined by increasing the parameters involved in estimating the parameter mean annual flood event, the correlation coefficient high and low error and parameter estimation will be done more carefully.
- Provide regional flood diagram should be considered Gambel distribution. In this case, uniformity values are observed floods. $Q_{2/33}$ should be as mean annual flood event should be considered in some studies this point not been met and Q_2 as the mean annual flood event can be selected which case the accuracy will be decreased studies. Very high correlation coefficient presented Figure (3) also shows this.
- After the flood of data using regional flood analysis to large size can be corrected and scrutinize. In this way, stations that have their flood statistics can give using regional analysis estimated. And compare these values and the actual percentage values or in other words, the error correction coefficient flood in each station to obtain. These coefficients can be continued in parts of the analysis Faqdamar regional (flood index), they flood is estimated that depending on the station which are more closely applied to the size and large amounts of flood correct and scrutinize be.

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