The estimating of discharge by physiographic factors in east of Gilan basins,Iran-South western of Caspian Sea.

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Abstract: The greatest civilization has located in marginal rivers and it has developed, the condition of Iran climate, water is an important in environmental development in recent years control of nature is for development of agricultural, obtain of industrial and drinking water. The aim of paper is recognition of relationship between discharges and physiographic factors in east of Gilan (Lahejan- Chaboksar) with uses of 20 years data of statically period (1986-2006). The research method uses of correlation and multi regressions in selected basins between discharge and physiographic fact. The result of paper has shown that between discharge and physiographic factors has reliability relationship and between discharge and 5 variables of physiographic factors is high relationship (p-value <0/05) and the curve of comparative between fore case discharge and 5 factors model is very near and sure able.In the end of paper submitted of monthly and yearly equation too.

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1. Introduction

The resources of a country are very valuable and have a great importance. so, the correct use of the resources by the best way is very important for each country in order to balance between the resources and human needs. One of the most important resources that has great value is water and is considered as a economical goods these days. Iran is considered as areiqueregion, according to special geographical conditions. Every year, many investments have been made on developing of water resources,dam construction, establishment of irrigation grids, drainage, feeding of under ground water and so on. The northern parts of Iran (east of Gilan province) are considered as humid and rainfall regions; however, it is not enough because these regions are faced with water deficit especially in the time of rice cultivation. As we know, therurals and most of the cities in Gilan province are located along the basins and near the rivers, therefore the recognition of environmental factors of basins and physiographical characteristics are very important for getting to sustainable development. Due to fixed geomorphologic parameters of basins and an accurate evaluation of topographical maps and aerial photos it can be said that the best given model for analyzing of hydrographs, is the model that can present the logical relation between hydrologic response and these parameters. Hanifepour(2008) has investigated the changes of water balance factors of Gilan's east basins. Baladast (2008) estimated the relation between discharging and the physiographic elements of west basins of Gilan province (Talesh-Astara) and he showed that the correlation between discharging and five physiographic variables (slope, area, tense of consentration, Gravalius coefficient, average height) is very high. Farajzade (2001) used the physiographic characteristics of basins in order to assess the flood discharge in Zohre and Kheyrabad basins (Yazd). Pourhemat with his colleagues for estimation of the rive's discharging in northern region of Alborz, used the regional statisticanalysis. Mousavi (2000) has studied the most important physical factors and the effective climate on regional flood models by the use of 70 parameters of river and31 characteristics of Salt lakebasines.Toumas Winston (1968) believes that area is one of the most important elements of alternative equivalent.caunti and Moisllo (1987) believe that mean daily precipitation and annual maximum precipitation are very important in investigation of basins.

2. Material and Methods

The method of this research is descriptive-analystic by the use of geological and topographical maps and statistical software. At first, the of 6 hydrometeric stations were extracted for a period of 20 years. the selection of these stations is based on the hydrographs that have equal regim (snowy-rainy). the reconstruction of imperfect stations has done by Excel software. also, for recognition of divergence points, Runs test has been used. The relation between discharging and basin's area is one of common models that is called a variable model. Julin and his colleagues showed that the mean annual debit is linked to height, length, width and the mean slope of basins. (Julin, Miller, onesti and et al, 1980). in this model that is called multivariable models, one independent variable (area) is in relation with one dependent variable(discharging) and the relation of other variables is not considered. also, the changes of one variables are in relation with the changes of other variables. In present research discharging is considered as dependent variable and physiographic elements are considered as independent variables.

Y=a+ $b_1 x_1 + b_2 x_2 + \ldots + b_n x_n$ (1)

In this relation, Y:dependent variables, b_{1-n}:slope coefficient,a:fixed coefficient and x_{1-n}: independent variables. In multivariable regression method, for calculation of coefficients, many methods have been used. one of these methods is Backward thet is used in present research. In this method, variables are omitted by the order of importance. (Faraj zade,2001)

Location of study area:

The Eastern part of Gilan province,on the one hand is limited to the Caspian sea coastal with the height of approximately 28 meters lower than sea level and the other hand is limited to the Alborzmountians. Ingeneral, the cultivable parts are located a long the Caspian sea as a narrow strip. The Eastern plain of Gilan province is located between 49º 45" to 50º 37" E and 28º 37" to 36º 50" N. this region is formed by river alluvium that flow to the Caspian sea.

3. Results

At first, five physiographic elements such as area, meanslope, average height, tense of concentration and Gravalius coefficient with the meaning level of 95% is calculated by the use of Minitab soft ware.

Q= -1.48+0.0222A – 0.0419S+0.00710Elv – 1.08Tc+4.58C

R^2=99.8% P-value=0.0

Where :Q=mean discharging(m^3/sec)S=mean slope of basin(percent).

Tc=Time of concentration(h),A=area of drainage basin(km^2), Elv=average height(m), C=Gravalius coefficient

P-value=rejection or acceptance of statistical test,

R^2=the correlation coefficient

the results of correlation relation are shown in Table 1.

Table1. Annual regression between discharge and 5 physiographic factors.

	Q	A	S	ELV	tC
A	0.998				
P- value	0.0				
S	-0.805	-0.782			
P- value	0.054	0.066			
ELV	-0.632	-0.657	0.312		
P- value	0.179	0.157	0.547		
tC	0.955	0.942	-0.866	-0.410	
P- value	0.003	0.005	0.026	0.419	
C	0.899	0.899	-0.544	-0.678	0.847
P- value	0.015	0.015	0.264	0.139	0.33

In aforesaid relation,it can be seen that the correlation between discharging with mean slope and Gravalius coefficient is very low.therefore,these two element(mean slope and Gravalius coefficient)are omitted and the correlation between discharging with area and average height and Tc are calculated (Table2).

Table 2. Annual regression between discharge and area and time of concentration and compactness factor and |Slope.

	Q	A	S	tC
A	0.998			
P- value	0.0			
S	-0.805	-0.782		
P- value	0.054	0.066		
tC	0.955	0.942	-0.866	
P- value	0.003	0.005	0.026	
C	0.899	0.899	-0.544	0.847
P- value	0.015	0.015	0.264	0.033

The annual relation between discharging and 4 physiographic elements(area,meanslope,Tc,Gravalius coefficient)

Q=0.46+0.0149A – 0.0097S+0.051 Tc+0.82C

R^2=99.8% P-value=0.061

The annual relation between discharging and 3 elements (A=area,S=average height, Tc=Time of concentration) is given in Table 3.

Table 3. Annual regression between discharge and area and time of concentration and compactness factor.

	Q	A	tc
A	0.998		
P- value	0.0		
Tc	0.955	0.942	
P- value	0.003	0.005	
C	0.899	0.899	0.847
P- value	0.015	0.015	0.033

Q=0.539+0.0156A+0.184 Tc+0.084C

R^2=99.8% P-value=0.004

With attention to(Table 1) the average height which is less correlated than two other elements is omitted because of comparison and affecting of physiographic elements in determination of discharging. so, the correlation between discharging with area and time of consentration is considered:

The relation of annual discharging with two elements (area,Tc) is illustrated in table 4.

Table 4. Annual regression between discharge and area and time of concentration.

	Q	A
A	0.988	
P- value	0.0	
tc	0.955	0.942
P- value	0.003	0.005

Q = 0.631 + 0.0157 A + 0.184 T

R^2= 99.8 % P- value =0.0

In table 4,it can be seen that,the correlation between area and discharging is very high,sojust the relation between these two elements is considered (Table5).

Table 5. Annual regression between discharge and area.

	Q
A	0.988
P- value	0.00

Q = 0.915 + 0.0179 A

R^2=99.6 % P- value = 0.0

Table 6 is shown the comparison of measured discharging amount and calculated discharging amount by physiographic elements in different situation (annual).

Table 6. Comparison of Actual and estimating discharge.

River	Station	Actual	5 factor	4 factor	3 factor	2 factor	1 factor
Shamrod	Totaki	3.99	4	3.92	3.94	3.93	3.77
Bargli	Otagh	3.42	3. 43	3.41	3.32	3.31	3.35
Shalman	Golchal	3.20	3.21	3.23	3.26	3.27	3.28
Shalman	Shalman	7.89	7.91	7.88	7.91	7.90	7.93
Khoshke	Baji	2.71	2.71	2.59	2.64	2.63	2.72
samosh	Harat	2.57	2.57	2.68	2.73	2.72	2.72

The regression relations of debit evaluation with five physiographic elements are given in table 7.

Table 7: Regression coefficient of monthly discharge estimate with 5 physiographic factors.

regression coef.	Month	regression coef.	Month
Q = 2.24 + 0.0263 A - 0.0167 S + 0.00434 Elv - 0.452 Tc + 0.121 C R^2= 98.6**%** P- value = 0.00	April	Q = 0.263 + 0.0496 A - 0.0709 S + 0.00538 Elv - 2.27 Tc + 5.83 C R^2=92.3% P- value = 0.0	Oct
Q = - 1.48 + 0.0302 A - 0.0399 S + 0.0175 Elv - 2.16 Tc + 4.72 C R^2= 99.8 % P- value = 0.0	May	Q = - 7.62 + 0.0386 A - 0.124 S + 0.0151 Elv - 2.75 Tc + 14.6 C R^2= 93.2 **%** P- value = 0.002	Nov
Q = - 3.11 + 0.0199 A - 0.0387 S + 0.0166 Elv - 1.91 Tc + 5.58 C R^2=96.8 **%** P- value = 0.0	June	Q = - 7.06 + 0.0263 A - 0.121 S + 0.0177 Elv - 2.48 Tc + 13.6 C 0 R^2= 99.4% P- value = 0.001	Dec
Q = 2.40 + 0.00870 A + 0.0519 S - 0.00161 Elv + 0.750 Tc - 4.64 C R^2=98.7 **%** P- value =0.001	July	Q = - 6.28 + 0.0168 A - 0.130 S + 0.0123 Elv - 2.64 Tc + 14.5 C R^2=99.4 **%** P- value = 0.002	Jan
Q = 2.05 + 0.00426 A + 0.0401 S - 0.00249 Elv + 0.811 Tc - 4.01 C R^2= 96.3**%** P- value = 0.001	Aug	Q = - 4.03 + 0.00850 A - 0.126 S + 0.00531 Elv - 1.76 Tc + 12.4 C R^2= 92.7**%** P- value = 0.002	Feb
Q = 3.12 + 0.0131 A + 0.106 S - 0.00672 Elv + 2.23 Tc - 9.02 C R^2=95.5 % P- value = 0.002	Sep	Q = 1.64 + 0.0237 A - 0.0297 S + 0.00144 Elv - 0.295 Tc + 1.18 C R^2=99.5 % P- value = 0.001	March

4. Discussions

Considering the comparison between results of annual discharging calculations and physiographic elements in different situatin,it's observed that there is a relation between discharging and physiographic elements and the existence of more elements in this relation cause the more accuracy and also the discharging evaluation graph is more conform with calculated discharging graph.in fact,the more variables there are,the more accurate assessment there are.with attention to the estimation of correlation rate of discharge equations by physiographic elements during the different months of year, it can result that the correlation percentage amounts is reduced during Mehr and Shahrivarmonths. it's because of the coefficient of numerous changes of parameters according to the rainfall in this basins.Therefore the amount of rainfall run off that has a significant effect on discharging changes is not the indication of all area of basin.

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