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Prediction of the Weekly Mean Discharge into Reservoir of Doroudzan Dam Using HEC-HMS Model and its Comparison with Observed Data (1992-2001)

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Abstract. In this study, the first, considering to data and information from available rain stations in the basin of Doroudzan, we achieved the floods volume from rainfalls, by HEC-HMS model, then compared the observational weekly data of hydrometric stations in that basin. To calibrate the model and increase its accuracy has been used of the exact and assured flood hydro graphs in concentration point of basin. In general, model's results show that has occurred the maximum flood volume in the 28th week of 2000-2001 (the raining year), and its minimum has occurred in the 52nd week, 1995-96(the raining year). Also for this comparison, the statistical evaluations have done involved calculation of graphical and numerical criteria. In graphical criteria, correlation coefficient (R^2) is 0/9732 and in numerical criteria, Mean Absolute Deviations (MAD) is 3/44. Finally, the results of assessments represent the good performance of the model in the estimation of mean weekly inflow into reservoir of Doroudazn Dam.

Keywords: Discharge, HEC-HMS, Doroudzan Dam

1. Introduction

Water is a basic factor in economic, social… growth and development in the nations and human societies. Most of hydrologic processes are strongly nonlinear and they are chronologically and locally so changeable. Form these processes, for instance, can offer to rainfall-runoff , that it is considered as a most complex hydrologic process ' and generally , modeling of the rainfall-runoff and forecast the river flow is performed in two ways :1- Empirical models 2-computer models.

In this study, has been attempted that collecting the data and information like daily rainfall, CN of the area , river base discharge , flow section; and by using HEC-HMS Model ,we calculate the level of discharge and compare it with real statistics.

2. Research method

Doroudzan catchments are a sub basin from the large kor catchments in the southwest of Iran and North of Fars, and are located in the upstream of Doroudzan dam, and its runoff enters to the storage of dam. These catchments are formed by three smaller sub basins:

1- aspas, code :4321 2-Khosro shirin ,code:4320 3-Kord-Kamfirozz,code :4319, Included.These three sub basins, codes are: 4319-1, 4319-2, 4319-3, and 4319-4

Geometrical properties of these sub basins is given in Table (1).

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Form 520 weeks that there is its rainfall statistics, 30 weeks are accidentally chosen. For choosing accidentally the weeks, we knew that the rainfalls is started from the second half of November and continued until the last of the first half of April, so we chose 13 weeks from mentioned reach, and also 13 weeks were chosen as maximum annual rainfall, but there weren't in above reach. The 4 final weeks, have been chosen without considering the maximum rainfall. The flood volume calculated and estimated the observational discharge, too. (Table 2).Moreover, the flood hydrograph is evaluated in the concentration point of basin by using the model, that its maximum has occurred in the 28th week of 2000-2001(hydrograph(c)), and its minimum in the 52nd week of 1995-96 (hydrograph (b)), and the linear curve in the 18thweek of 1995-96 (hydrograph(c)).

3. Data Analysis

For comparison the computational and observational data following criteria's have been used:

1- Graphical criteria 2-Numerical criteria

In order to evaluate, in according to graphical criteria is used two following curves:a) The regression line between observational and simulated values (hydrograph 2) b) The observational and simulated hydrographs by HEC-HMS model (hydrograph3).

The curve (a) is estimated with three factors:

- Regression involved gradient points (m)
- Regression – line distance from origin (b)
- Correlation coefficient(R^2)
-

MAD	STD	MAE	MSE	RMSE	m	b	R^2	%e	Max(e)	Min(e)
3/440	4/090	3/490	17/457	4/178	1/030	-0/595	0/973	8/512	9/43	-5/71

4. Discussion

In this study, after building the HEC-HMS model, and also comparison it with the actual data, were achieved the following results:

1-Optimization of HEC-HMS model leads to approximate the values of the CN parameters (lag time….) to the actual Values, consequently, leads to increase the model accuracy.

2-Considering to the relatively lower error in HEC-HMS model in modeling of Doroudzan catchments, it is recommended using of this model in research and operate projects in Kor River and Doroudzan area.

3-Error in HEC-HMS model is for following reasons:

a) Standard W.M.O is considered in case of the number of rain stations.
b) Rainfall elevation is assumed constant in reaches during 24 hours
c) No considering all the springs in the area because of the lack of discharge data.
d) The cross section of the rivers in the area is assumed constant, because of lack of mapped data from their cross sections.
e) Since the catchments of Doroudzan are large, so there isn't information about their sub basins for slighter modeling of mentioned catchments.

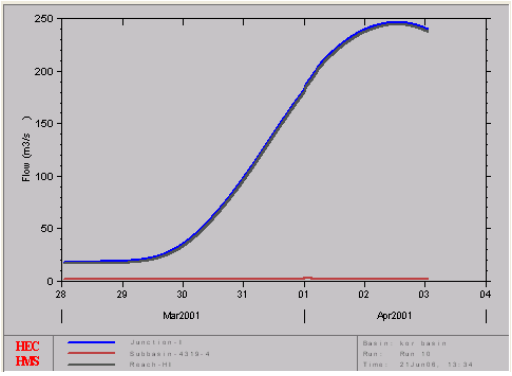
Table 1-Geometrical properties of different basins

Concentration time(hr)	Lag time (hr)	Slope of basin	CN	Length of stream	Perimeter (km)	area (km^2)	Basin code
119/21	71/38	0/0030	69/1	284370/08	237/6	161/23	4321

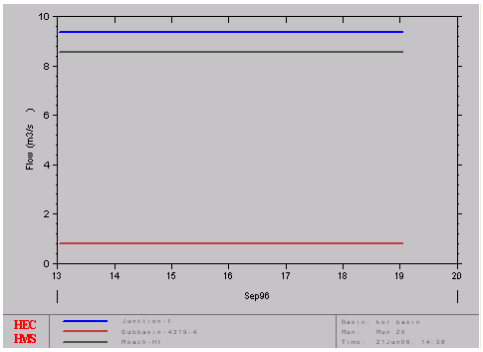
35/54	21/28	0/0084	68/74	114733/46	139/8	726/34	4320
19/33	11/58	0/0095	67/30	55097/77	81/5	322/00	4319-1
44/35	26/56	0/0086	66/49	142709/65	129/5	546/20	4319-2
10/59	6/34	0/0070	66/21	20748/03	121/4	739/00	4319-3
40/17	24/05	0/0076	65/61	113346/65	122/6	480/40	4319-4

Table 2 - The computational weekly flood volume by using HEC-HMS model, mean weekly discharge (computational and observational)

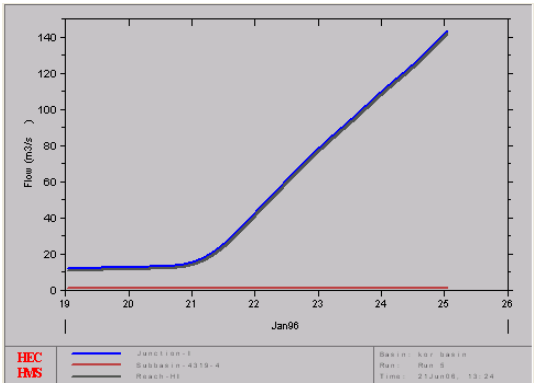
Time (Week)	Computational weekly flood volume (m^3)	Computational mean weekly discharge (m^3/s)	Observational mean weekly discharge (m^3/s)
1	5612544	9/28	10/73
21	27076896	44/77	46/21
25	39432960	65/2	64/06
76	38314080	63/35	56/16
80	48184416	79/67	72/94
95	9459072	15/64	14/96
123	16632000	27/5	32/1
129	30971808	51/21	54/07
146	20085408	33/21	31/81
178	34007904	56/23	48/07
185	32665248	54/01	56/23
190	27276480	45/1	41/08
214	14200704	23/48	19/42
226	21470400	35/5	31/83
236	31153248	51/51	54/58
260	4862592	8/04	10/28
273	12216960	20/2	25/91
286	41259456	68/22	63/11
324	20333376	33/62	33/54
325	25244352	41/74	36/43
340	43587936	72/07	77/29
344	40346208	66/71	69
345	38162880	63/1	66/32
382	24034752	39/74	37/46
394	40908672	67/64	72/23
408	17853696	29/52	30/14
439	23248512	38/44	36/33
443	28177632	46/59	44/26
493	69860448	115/51	106/08
496	61725888	102/06	100/58



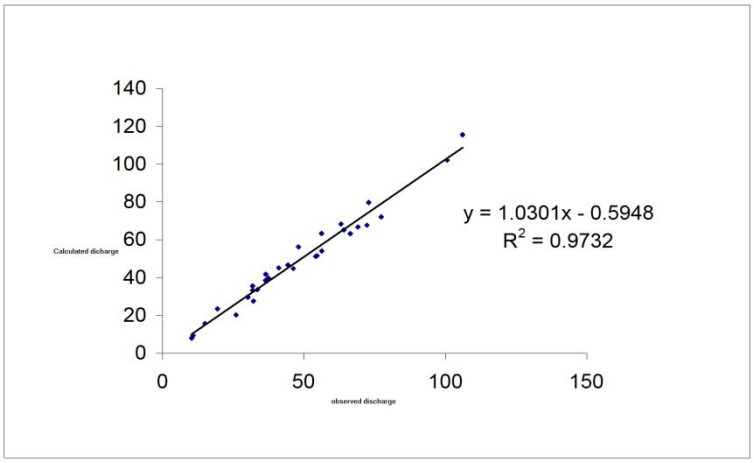
Hydrograph (a): Flood hydrograph in the 28th week 2000-01. (The raining year)



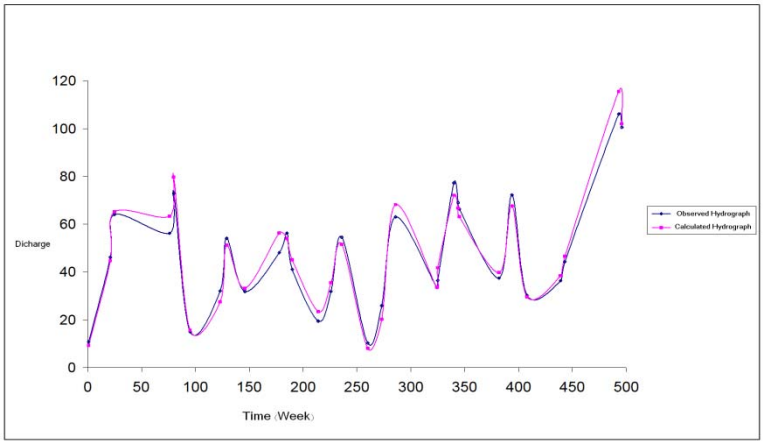
Hydrograph(b): Flood hydrograph in the 52nd week of 1995-96(The raining year)



Hydrograph (c): Flood hydrograph in the 18th week of 1995-96 (the raining year)



Hydrograph 2 –Regression analysis between observational and computational discharge.



Hydrograph 3 – The observational and computational hydrographs.

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