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Investigation of Flood Maps and Drawing it with Using Numerical Software

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Abstract: A new science of river engineering is combination of hydraulic and hydrology science for studying flood wave movement. Studying flood behavior and some information of upstream of river, it could be possible to practice almost exact time of flood event.Basic difficulties that cause as a result of non-observances of rivers right constructing and inculcating in these areas normally cause loss of life and property for inhabitants of river side in time of rain season and flowing of water flood. Researches in our country show that yearly growth of in dilation events are almost%4 and yearly growth of loss to property causing by it is almost%6 during 40 years period 11331-1370.Many of mistreatments to the river right directly decrease capacity of water flood transmission or increase water level that prepare more ways for destructive water flood so determining of rivers water flood riverbed in some way is determining of risk bounds and restricted area of probable damage incidence that is important because inhabitants living and ecological security. Flood maps have much application in studying of floodplain. Management by engineers decide to find a new way for controlling and managing of this phenomenon using new instrument like mike11 and GIS because of increasing by water flood.In this research draft flood plain between maroon dam and cham-e-nezam by mike11 software and research stages show that flood plain process is an accounting process that uses repetition way and modeling for the purpose of result completion and showing them these maps can receive as a subtle instrument for developmental strategy.

Key words: River engineering · Flood plain map · Numerical model · MIKE 11 · Arc view

INTRODUCTION

A new science of river engineering is combination of Hydraulic and Hydrology which discuss about flood were movement of river passing way. Investing action of flood event probability and some information of type of flood event, prediction of flood event of downstream of river is effectivelypossible. The prediction of hydraulic behavior through river against probably flood events has many significant roles to calculate urban Design & construction and other applying usage of watershed. Moreover, every engineering project which is inters connection between. Human existence and water on rivers it is very important and should been considered very well. Nowadays, these kinds of maps are the most important toworld of design and more importantly, there are so beneficial for investment. These maps include flood event with specialreturn period of Special River which are presented. Recently, leaders and governors of development country try to minimize risk of flood event with using best management practices (BMPs). This method is known of best studying step forflood controlling. For this purpose, many skillful engineers try to simulate and predict this phenomenon with using combination of MIKE 11 and GIS. Targets of research:

In this research; river hydraulic behavior has been simulated with using MIKE 11, in this research, water profile they been calculated. Flood plan map. With different periods had beendetermined with using arc view, finally.

Latinity Rivers

Bordbar: A [3, 2] tried to provide: best cross section of basher river and flood plain map with using Arc view and GIS (Arc View). MIKE 11 and he observed the results had may closeconvergence. Vahabee [4] studied Taleghan (north of Iran) watershed and produced flood path domain with using HECRAS- MIKE11.In these maps all forbidden: and conditioned zone: are studied too.-In the Mahab Ghods Consulting Engineering Company from (1989-1995)

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all flood plan map of Simireh river and Zarineh river had been produced. With using FLD routing softwareIn this study flood risk are Categorized and critical zone with different return period were determined to proposed flood routing and flood prediction project of are Executive program and try to study different methods of flood routing.

MATERIALS AND METHODS

Flood event is knownas very complicated phenomenon and it is many hard to be modeled. But it's possible to predict this natural event. To some extent, combination of MIKE 11 and GIS proved that there are many suitable weapons to study flood plain and geometric produced with much high accuracy.

Case Study: Old name of Maroon River is *Tad* and come from nil mountains, this river continue and of torand received tributaries which is fromBehbahan plain. Behbahandam is locatedat up stream of Behbahan station. The Maroon watershed is located at south regionof Zagros Mountains and its latitude and longitude is from S.1°10' and 47° and 31°42' to 30°29'.The total area if Maroon watershed about 10685 square kilometers. The climate of this watershed is influenced by low level latitude and height changing and Persian Gulf at downstream.

Hydrological Condition: Maroon River has three hydrometric stations. In this study length of Behbahan to Cham Nezam had been studied. Hydrometric station of Behbahan has statistics about discharge of river from (1967-1968) to (2001-2002). Hydrometric station Cham Nezam on Maroon River has Discharge of river data from (1955) to (2001-2002) and other some modifying studying this information optimized to 30 years data (Management of Hydro-power &water research (2001)" Report of watershed in khozestan).

Different Methods of Flood Plain Building:

- Methods of flood plain mapping are divided of below:
- Observation method:
- Comparison of air pictures:
- Using satellite and remote sousing
- Manual calculation
- Using mathematical methods

Fig. 1: View of dam-Behbahan, Iran

Numerical model, MIKE 11: In this study; MIKE 11, has been chosen. This model is one of the best models and one of characteristic of model is simulation under unsteady modeling. Mike 11soft ware is one engineering software that has been produced in order to simulation of flood, water quality and sediment transport at river or canals and for irrigation system has been used effectively. This software has been created and developed practically in Denmark, at Hydraulic institute since 1972 till now. In this researched undetached sediment transport model (Mike 11) for Hydraulic modeling and simulation of sediment movement of Karkheh River have been utilized completely. Basic core OF Model was based on Hydro dynamical module and it has been capable to determine Hydraulic parameters Such as: Depth and profile of water, discharge or velocity,… havebeen calculated mathematically with using explicit finite different method at unsteady flow condition. H.D. module could be able to solve mass remaining equations and momentum formula (San-venant equations) as Hydro dynamical path and up degree algebra equation with using (6 point) technique (Abbot – Ionesco method, 1967). [1]. All results at Hydraulic calculation are based on sediment transport calculation (ST) and model can determine sediment transport rate with using semi – empirical equation such as: (Ackers + white equation) (1973) or Angeland – Hanson equation (1967). [1, 3] Its also could be able to estimate bed surface changing with using continuity equation (Priceman algorithm) and final bed profile was estimated [4].

The Applied Equation: Of this model is continuity equation and momentum as below:

$$\frac{\partial \varnothing}{\partial x} + \frac{\partial A}{\partial t} = \mathrm{q}$$

$$\frac{\partial \varnothing}{\partial x}+\frac{\partial}{\partial t}\left(\propto \frac{\varnothing Z}{A}\right)+g.A\times\frac{\partial y}{\partial x}+g\times$$

$$\frac{n^2\times|Q|\times Q}{AR^{4/3}}=gAS_0+Vg\cos\varnothing+\frac{r.w}{\rho}\ B\cos\theta$$

In Which: V: average velocity Q: flow discharge y: flow depth n: Maning coefficient S: river bed slop á: modified energy coefficient ö: angle of connection between branch to main channel R: hydraulic radius r: wind tension W: velocity of wind ñ: density of air B: width of surface flow t: time g: gravity acceleration.

Equation of (1) and (2) has been solved whit using implicit different method and discharge and flow depth are convinced for each grid for each. Interior grid to equation has been written and for boundary. Boundary grid, boundary condition can be used.If initial condition are exist, oneequation matrix couple provided this matrix has been solved with using double swap method and it will be continued.

(Mike11 Software) Application: Similar to the other sediment and Hydraulic model, this model (mike 11) needs verities of information to run such as: 1_ Geometry data, 2_ Hydraulic information

1_First of all, at the Geometry section: all river plan and cross sections were introduced to the model. For this purpose, its need that all maps with scale: 1/2500 and (UTM axes) were introduced to the model. Geometric data of river has been introduced to model. Each section has been introduced to model respectively. Lila group point from left to right In this study, many cross sections such as; meander and construction at length of river like bridge, diversion dam and other has been surveying as well.

2_At the next step, for Hydraulic dataBoundary condition has been applied:

For hydraulic calculation; boundary condition of upstream and downstream is completely essential. Boundary condition at upstream is introduced as hydrograph for each iterance branch and for downstream is known as relationship-discharge-height.

Upstream Boundary Condition: Flood plain zone are determined due to boundary of spread flood and return period and conditional of construction on the river so, flood interring to Maroon River are influenced by regulating dams and after dam move to river.

Downstream Boundary Condition: The D.S. condition is fixed and is high- discharge relationship of Cham Nezam hydrometric station.

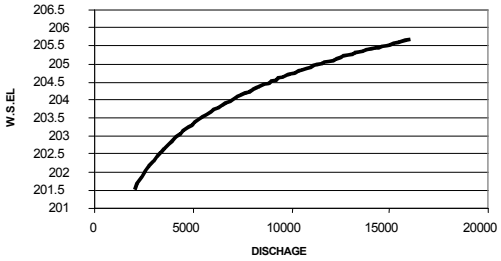


Fig. 2: Cham Nezam- height- discharge- relationship

Flood Routing of Maroon River: For flood routing simulation of Maroon reservoir,the following information isintroduced to the model:

- Inter hydrograph to reservoir
- Height of reservoir
- External- height- discharge- equation

Relation of dam height is derived from dams and way.

Hydrograph of Maroon River which is recorded had been introduced to model. After software running and calculation of flood hydrograph, flood of middle sub water of Behbahan. Added to existing flood and finally introduced to model.

Manning Coefficient: By consideration bed materials, type of plant cover, river paths have been divided to different group and finally, best initial coefficient has been estimatedperfectly.At next step, these coefficients has been changed to minimized, gap between, calculated water level and observed value accurately (verification) after calculation difference between water level and observed moved to 4cm. The results illustrated at Table (2).

Its need to be adding that, due to large area of study zone, majority number of branch sand and Numbers of cross sectionsare introduced to model. Sensitivity analysis had been done and fluctuation of Manning coefficient are 8, 15 respectively.

Arc View GIS: Briefly, the concept of this software is as blew:

Creation of geographical data system, simple graphical environment, analysis of geographical position and acceptable information graphs.

Flood Plain Mapping: After introducing information to model, it could be possible to study water level behavior around each cross section with considering return period. Therefore, flood plain with return period has been plot for different return period (With using Arc View).

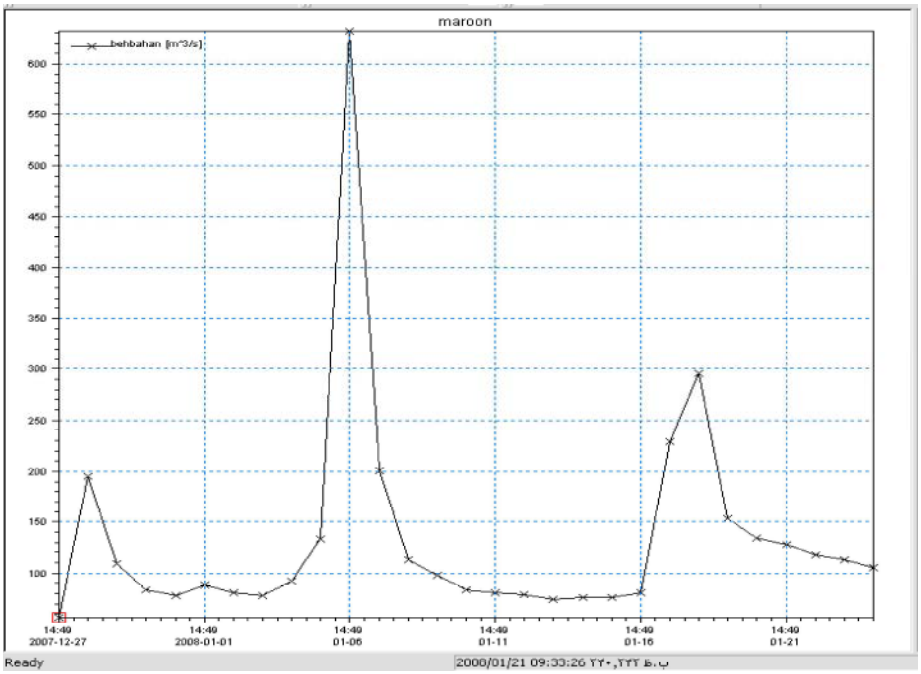


Fig. 3: Enter diagraph of MIKE 11

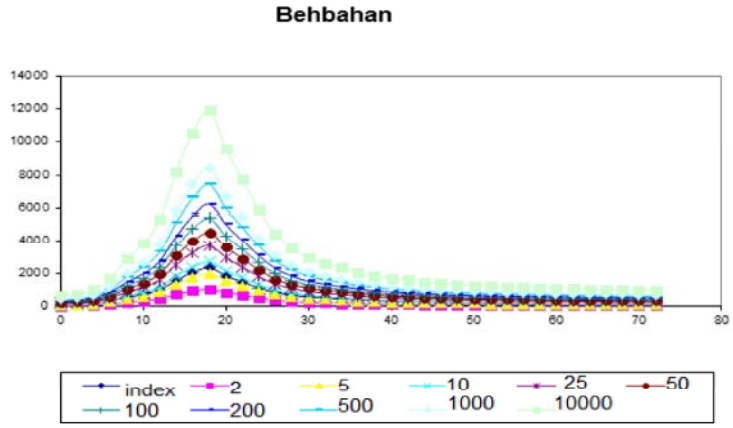
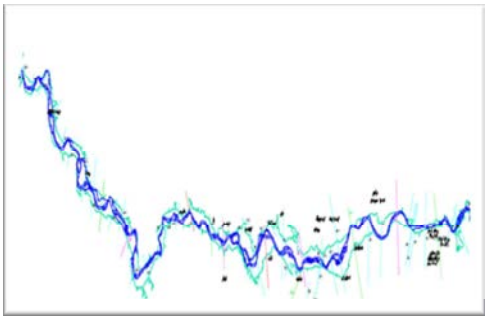


Fig. 4: Routing hydrograph of Behbahan station



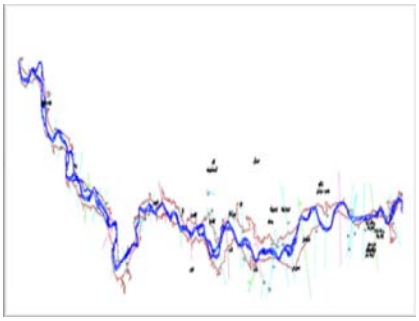


Fig. 5: Flood plain with (1000= return period) Figure (6): flood plain with (500 years as return period)

Table 1: Dischargewith different return period:

Discharge (m^3/s)	*2*	*5*	*10*	*20*	*25*	*50*	*100*	*200*	*500*	*1000*	*10000*
Returnperiod (year)	*632*	*1239*	*1718*	*2222*	*2389*	*2928*	*3493*	*4083*	*4901*	*5547*	*7861*

Table 2: Difference coefficient of Maroon River.

No.	River	From	To km.	R
1	Maroon	0+000	7+837	0,033
2	Maroon	7+837	49+999	0,04

Table 3: Results of sensitivity analysis of model to Maning coefficient

y. of coefficient changing	Average water level changing
Maning coefficient more 8%	+0.126
Maning coefficient more 15%	+0.238
Maning coefficient less 8%	-0.137
Maning coefficient less 15%	-0.264

DISCUSSION AND CONCLUSION

According to observation and calculation, Manning coefficient at study length had different value: which are 0,033 for length of0+000 to 7+837 and 0, 04 for length of 7+837 to 49+999.

It could be calculation that, flood plain processing is calculation process and it's based on repeat operation.

- Flood plain maps are very useful for strategically development.
- Flood plain monitoring (with MIKE 11) is very powerful weapon for reducing flood risk at management procedure.
- Area andPerimeter of flood control Zone of Maroon River is as below:

Return period	Area	Perimeter
2	11.2	129.45
5	15.83	130.90
10	19.14	134
25	21.57	138.77
100	22.9	140
200	23.33	145.58
500	25.28	155
1000	26.67	159

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