Geography and Development
10nd Year- No. 26 – Spring 2012
Received : 15/3/2011 Accepted : 5/1/2012
PP : 9-12

The Geometrics Parameters and Role of Them in Time - Interval Changes Sequence of Bed Rivers (Case Study: Hor Rood a Sub Basin of Karkhe River in Lorestan Province)

Dr. Mojtaba Yamani
Associate Professor Faculty of Geography
University of Tehran

Siyamack Sharafi
P.H.D Student of Geomorphology
University of Tehran

Introduction

Rivers and streams are fully dynamic systems and their position, shape and other morphological characteristics are changing continually over the time. Due to the bank's erosion and displacement of river banks, every year a great surface of agricultural lands, residential areas and bank facilities are being destructed. Different factors effect on the destruction of river floor and walls, including scour erosion of the banks, erosion and destruction due to entering agricultural drainage and so on. A group of factors such as waterway slope, flow rate, characteristics of bed materials, frequency and flood intensity determines the river morphology based on the time and spatial aspects. In this regard Leopold and Leman divided the rivers from morphological point of view in three groups of direct, meander and arterial. These patterns are also affected by these factors. Among these, meander pattern of the rivers as an effective parameter appears to be essential as a useful parameter to identify the hazards and the ways to conserve the existing resources and capital in different regions. This study investigated the lateral changes of the rivers that in the last years has threaten the communication path, agricultural lands and human structures besides the river banks, Therefore, due to the existence of bank erosion and morphological changes of the under study river, the aim is to study Hor rood River Geomorphology and its changes in a period of 52 years with a focuses on applied fields in different ranges of river engineering schemes. With this objective, identification of effective variables in bed instability for understanding the pattern of the river, changes trend, river path displacement in a long period of time and investigation of the factors and mechanism of bed changes is essential. And it was necessary that critical paths and parts of rivers have been detected concerning the bank erosion on the river. It was adapted by previous studies, calculated geometric parameters and field survey basis.

Research Methodology

In this research, the morphology of Hor Rood River has been studied through the spatial and temporal changes using the quantitative measurements. River plan and its geometric characteristics have been studied through the aerial photographs of military geography organization (1334), satellite images (IRS2007 and Aster2005) with a resolution of 5 and 15 meters respectively and Google earth's maps. To calculate the geometric parameters such as wavelength, sinuosity, radius and central angle of meanders, relative radius, length of the valley and etc in two mentioned period, river path has been

drown in Arc GIS software and tangent circles have been drawn on meanders in the AutoCAD software. After these measurements, statistical comparison between the geometrical characteristics of the two time periods was obtained. By the use of graphical directions, the spatial variations of river path have been identified and compared in past and present. In order to better understand and describe of the river morphology and measured geometric parameters Hor rood River has been divided into four reaches concerning with cross sections and morphological characteristics in each reach.

Discussion and Results

For classification and identification of hydraulic and hydro physic properties of rivers, it is necessary that some characteristics of river has been measured and calculated as quantitative geometric parameters. Geometric parameters such as, 1) wavelength, 2) the central angle of meander 3) meander radius 4) relative radius and 5) sinuosity of the river are some of the main quantitative measurable parameters. In this study, the geometric parameters of the river in 1955 and 2007 time period were measured, compared and analyzed.

Central angle probe in the period of the study shows that three of reaches are developed meanders concerning with Kornis classification method and fourth reach changed from developed meander in 1955 to underdeveloped meander in 2007 due to the mountainous region of the reach. But the averages of central angle of this three meanders has increased in comparison with averages of central angle in 1955. Radius changes of meanders show that the radius of the meanders has decreased from 1955 to 2007 except in reach 1. Sinuosity of the river in the period of the study probe shows that reaches number 2 and 3 were meanders and reaches number 1 and 4 were sinuous rivers in 1955. But reach number 1 has changed to a meander reach since 2007. Changes in wavelength and the length of the river valley shows that average changes in the wavelength and valley length from 1955 to2007 has changed to more than twice and its reason can be depended on high power of the river in soft and alluvial bed than mountainous regions. And also the average amount of wavelength in reaches 2, 3 and 4 has decreased from 1955 to2007. The average amount of valley length in reach 3 from 1955 to2007 has increased. But the average amount of valley length in reaches 2 and 4 from 1955 to2007 has decreased. It means changing rate in these two reaches was lower. Changes in relative radius shows that study reaches of Hor rood River are located in each three kinds of bents and their relative radius from 1955 to2007 has decreased. Reach number 1, is located in confined region. Reaches number 2 and 3 are located in free zone and their relative radius dwindle in 2007 declares decreasing in freeness of bents and increasing pressure on bents but bents in reach 4 are located in confined zone. It means bents are confined in mountainous zone. Bed width comparison in 1955 and 2007 shows that bed width in reach 1 has doubled and in reach 4 there was a little change (about 1meter). There were significant changes in bed width of reaches 2 and 3.

Conclusion

Probe in geometric data of rivers and changes in their shape and regime can shows variation trend in future. Calculated parameters of Hor rood River shows its changes in time series in the study reaches. These parameters show that the most changes has been occurred in reach 1 due to its erodible bed, bed load increase, braided shape and low vegetation cover. Variations in parameters such bed width, number of meanders; wavelength and etc approve the trend of these changes. Although sediment and

water discharge have been increased and slope decreased in reaches 2 and 3, there is lower changes. These changes have been occurred just in upstream of reach 2 and end of reach 3 in some bents which encompasses the meandering part of Hor Rood River. This reaches has been supposed to have the most changes due to sediment and water discharge increase and also slope decrease in reaches which are the most important factors in morphological changes in river. But evidences don't show this issue. Investigations and data incorporation shows fairly strong earth topology in the path of the river is the main reason. Although there is proper condition for bank erosion and morphologic changes in reach 4, the changes are lower and results showed earth strength against erosion, straight path of river and topography effects are the major variables. Thus regarding with river geometric parameters, effective factors in changes of regime and Hor rood River morphology we can infer that changing in reaches 1 through 4 has been decreased but sediment and water discharge have been increased. Overall results show there is no direct relationship between hydrologic factors and morphologic changes and the most effective parameter in morphologic changes and bank erosion of the studied river is river bed and bank material.

Keywords: Geomorphology, River, Hor Rood River, Geometric Parameters, River Changes, Lorestan province.

Refrences

1- Agharazi H, moradi nejad A, goudarzi GH, (2002), Protection of vegetation on the sides of ghareh-Chai River, Markazi Province, Sixth International River Engineering Conference, shahid chamran ahvaz university.
2- Ahmadian yazdi M, (2001), The role of vegetation in erosion control side meander, MS thesis, Rangeland and Watershed Management, Faculty of Agricultural Sciences and Natural Resources Gorgan.
3- Arshad S, saied M, abolghasemi H,(2007), Morphological changes of the river using remote sensing, case study: karoon river(1990-2003), Journal of Agricultural Sciences and Natural Resource, volume 14, number6.
4- Biedenharnd, S., Elliot, C.M. and Watson, C. C., (1977), The WES Stream investigation and stream bank Stabilization hand book, U. S. Army Engineering, P. 268.
5- Chris parker and et al, (2008), The effects of variability in bank material properties on river bank stability, Goodwin Creec, Mississippi, Journal home page.
6- Consulting Engineers, abdan faraz, (2001), Volume II (from hydrology and sediment), The first phase of the ayvashan Dam, West Regional Water, Department of Water Affairs lorestan province.
7- Dulati J, (2008), Geomorphological changes in the middle section of Atrak river with using GIS, MA thesis, faculty of geography, university of Tehran.
8- Gabrielle, CL., David and et al, (2009), The impacts of ski slope development on stream channel morphology in white river national Forest, Colorado, USA- Journal home page, Geomorphology, 375- 388.
9- Geological survey of iran, (1992). scale geological map Khorram abad 1:250000.

10- Ghafari G, solaymani K, mosaedi A, (2006), Changes in the side channel morphology using GIS(babbol rod mazandaran), journal Geographical Research, number 57.
11- Gharib R, masoumi HR, (2006), zohreh river morphology and changes in The hendijan coastal plains, Seventh International River Engineering Conference, shahid chamran ahvaz university.
12- Kornish, MRS, (1980) Meander Travel in Alluvial Streams, (4)35-82 in Proceeding of the International Work Ship on Alluvial River Problems. India. Sarita Prakashan Meerut, New Delhi.
13- Leopold, L.B and M.G, Wolman, (1960) River Meanders, Geological Society of America Bulletin, V 71.
14- Payrovan H, habibi M, vali samani JM, haghi abi AH, (1997), On geometric properties - hydraulic meander ghzel ozone Lower River salmon and morphological changes, Iranian Hydraulic Conference.
15- Petts, G.E. et al. (1986), Historical Change Large Alluvial River, John Wiley and Sons.
16- Rangzan K, (2002), Impact of immigration on the structure of urban rivers in the plains of Khuzestan using satellite imagery, Sixth International River Engineering Conference, shahid chamran ahvaz university.
17- Rangzan K, salehi B, salahshori P, (2008), Changes in the downstream region Karkheh dam after dam construction with using a Land Sat images, Iranian Geomatics Conference.
18- Reading, H. G., (1996), Sedimentary environments: Processes, Facies and Stratigraphy, 3rd Edition, Black well Science.
19- Schumm, S.A. (1980), Planform of alluvial river problems, India, Sarita Prakashan Merrut, New Delhi.
20- Shen, H. W. (1971) River Mechanics, vol., I, and II, Colorado State University, For Collins Colorado.
21- Talouri A, (1992), Understanding of river erosion in the alluvial plains, Research Institute of Forests and Rangelands, 1 edition.
22- Talouri A, (1994), Rivers and their geometric, Research Publications of Agriculture.
23- The Armed Forces Geographical, (1955), Scale aerial photographs 1:55000.
24- The Armed Forces Geographical,(2005), Aster satellite images with a resolution of 15 m.
25- The Armed Forces Geographical,(2007), Aster satellite images with a resolution of 5 m.
26- Thorne, C.R. (2002) Geomorphic analysis of large alluvial rivers, J. Geomorphology, vol. 44, No 5, 203- 219.
27- Yamani M, hossein zadeh MM, noheghar A, (2006), Hydrodynamic babbol and talar rivers and Instability and its role in changing their geometric, journal Geographical Research, number 55.