The determination of the erodity and sedimenting area and evolutionary situation of the basins from the comparative view of point by using dimensionless hypsometric curves (Case study: Vzneh and Baneh Bsins)

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Abstract

*The physical attributes of Basins have great effects on the process of erosion. Among the most important parameters of basins that directly or indirectly have great effects on the erosion. for example the elevation of basin indicates its climatic condition and it is effective in raining and considering the face that each rainfall has its own hydrology it has special role in erosion. therefore in order to analyze the condition of erosion and sedimentation with a comparative view in the basins of Vazne and Bane, undimensional hepsometric tables and curves have been designed.It becomes clear that in the Vazne basin the development of plain and elevation is to some extent balanced. The low space between two curves is indicative of the approach of the basin to equilibrium .in contrast in Bane basin considering the condition of the curves it becomes clear that tis Basin is more away from that equilibrium and is younger and less development.***

Key word: *Bane basin,Vazne basin, Erosion, dimensionless hypsometric curves*

Introduction

Erosion has a Latin stem meaning attrition of ground surface. This term was first used by Pank in 1894 (Refahi, 2004). In fact accelerated ground erosion is considered as a global issue due to its effects on economy and environment (Lim et al, 2005). Dimensionless hypsometric curves are very important tools among others by which some important physical indices of basins can be obtained which are used for basins comparison (Alizadeh, 2003). On the other hand, there is obvious relationship between hypsometry curves and river basins evolution (Huang, 2006). Thus in order to examine sedimentation and erosion in two basins and their related areas and identify evolution condition and determine basins equilibrium, real and theoretical dimensionless hypsometric curves and tables are drawn and then are compared.

Material and Method

Research method is based on field and library study as well as using environmental and geographical science tools and techniques such as maps and software. Hypsometric curves

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can be drawn both classically and in dimensionless form. Its classic form which is indicative of surface per altitude distribution can be interpreted in terms of erosion or sedimentation stages, but can not be interpreted like mathematical equations qualitatively. Thus, Long Bin developed hypsometric curves analysis in dimensionless form (Farifte, 1370). Therefore real and theoretical dimensionless hypsometric curves are calculated and drawn for both basins, which are qualitatively interpretable like mathematical equations and by which status of erosion and sedimentation in basins can be studied. In real dimensionless hypsometric curves, X value is obtained by partial accumulative area (a) division to total basin area (A) (X=A/a) and Y value is obtained by accumulative partial altitude difference (h) division to total basin altitude difference (H) (Y=h/H) which are placed in two diagram's axes. It is clear that Y and X difference range always varies in 0 and 1 (Movaheddanesh, 1995). It should be mentioned that obtained diagrams can be interpreted both qualitatively and quantitatively. However, theoretical dimensionless hypsometric curves are also drawn for both basins in order to better understanding and comparison of erosion and sedimentation in basin surfaces. For drawing these curves, X and YC values are used that X=a/A and YC can be calculated by following equations (eq.1,Movaheddanesh, 1995).

$$Z = \frac{\sum \log y}{\sum \log u} \qquad u = \frac{d - (x + a)}{(x + a)} \times a \qquad yc = u^{Z}$$

Where Yc is theoretical calculated altitude, *a* is selected distance to source and d= 1 + a. in other word, a = 0.2, d = 1.2, and z = 0.42.
This equation shpae indicates three stages of erosion: youth (erosion), maturity (equilibrium) and senility (sedimentation) which can be observed in figure 1 (Farifte, 1991).

Situation of Areas Under Study

Vazneh drainage basin is located in northwest of country, in south of West Azarbayejan Province and northwest of SardaSht town. Its geographical situation is in altitude 45´-16´ and 45´-26´ in east and latitude 36´-12´ and 36´-24´ in north (Fig.2). basin area was estimated 185.4 km^2 by GIS software in ILWIS environment and its altitude average of sea level is 1713.3 m (Salari, 2006).
Baneh drainage basin is also located in northwest of country, in southwest of Kordestan Province and northeast of Baneh town. Its geographical situation is in altitude 45´-56´ and 46´-02´ in east and latitude 36´ and 36´-04´ in north (Fig.3). basin area was estimated 96.28 km^2 by GIS software in ILWIS environment (Moradi, 2007).

Vazneh Basin

Desired values are calculated based on mentioned mathematical relations in order to evaluate and analyze errosion. Then, real and theorethical dimentsionless hypsometric curves and tables are drawn (Table 1, Fig.5). real and thoretical curves of these basins are obtained based on Eq.2 by r = 0.99 (correlation coefficient). This coefficient is relaible with relaiblity level of 0.99. Eq.2 is as following: In above figure, the diffrence of real gradients (what should be) with theoretical curve and actual gradients (what it is now) with real curves can be observed (Nakhei & Ghanavati, 2006). Regarding dimensionless hypsometric curve of Vazneh basin, theoretical curve is set upper than real one in upstream indicating errosin in this part of basin. With regard to dominant erosion trend, it can be said that this part is composed mainly of high and slope areas in which erosive processes are strong (Salari, 2006). On the other hand, the role of climatic processes is considerable in area under investigation (Jafarpur, 1978). In other words, this trend is extending toward about altitude of 1700m that in this altitude there would be equilibrium. Equilibrium in basin is matched to high areas of Vazneh plain. Beyond that, theoretical curve is set below the real curve indicating sedimentation in bed. By observing real and theoretical curves, it can be found that there is low difference between two curves which indicates erosion decrease and approximating basin to equilibrium state. Then theoretical and real curve are coincided completely in 1500m altitude and after that to basin exit, they have low difference. Generally about 40% of basin is subject to erosion and about 60% is subject to sedimentation(Fig4).

Baneh Basin

By observing real and theoretical curves drawn for this basin it can be found that theoretical curve is clearly upper than real one in upstream indicating considerable erosion for this part of basin. Curves are set with large distance to each other in this part suggesting strong erosion. This trend begins from basin altitude peak (2700m) extending to about 1600 altitude where two curves approximate to each other clearly and there is equilibrium. Then theoretical curve is set below the real curve indicating sedimentation in bed. This condition there is from 1600m altitude downward, in other words, to about basin exit in 1100m altitude. Generally almost 64% of Baneh basin is subject to erosion and about 36% is subject to sedimentation(Fig5).

Conclusion

In upstream of Vazneh basin, about 40 percent of area is subject to erosion. In remaining 60 percent, the position of two curves is vice versa and in these areas there is possibility of sedimentation in bed. It should be stated that the low distance between two curves indicates erosion decrease and tendency toward equilibrium. On the other hand, regarding real dimensionless curve it is noted that plain and altitude expansion is somehow balanced and overall shape of curve shows a basin in equilibrium state. By comparison, in Baneh basin, about 64 percent of theoretical curve of basin is set upper than real one, and therefore it is subject to erosion. It should be mentioned that most erosive areas are matched to mountain areas that upward slope as well as reduction of vegetative cover and fluidity power increase are its main reasons. In remaining 36 percent the position of is two curves is vice versa and sedimentation in bed is probable in these areas. By observing real and theoretical curves with regard to two basins comparison, it is noted that in Vazneh basin, the distance between two indicator measuring curves is small suggesting equilibrium state. But in Baneh basin, the curves' distance is larger in upstream and therefore, there is more strong erosion condition. Also in lower parts there is more severe sedimentary condition. Curve shapes indicate more evolutionary basin for Vazneh and younger basin for Baneh.

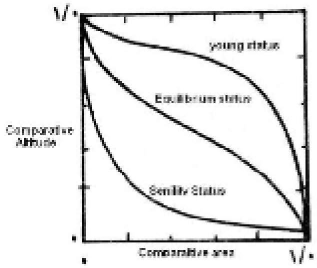

Fig1- Stag of erosion in basin

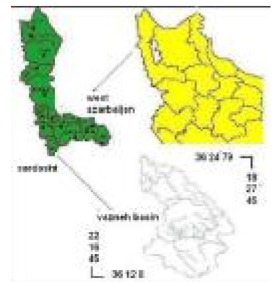

Fig2:The situation of vazneh basin

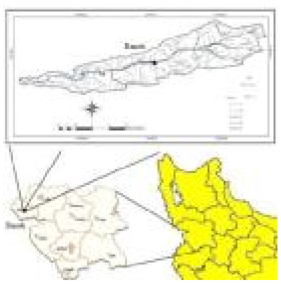

Fig3:The sitution of Baneh basin

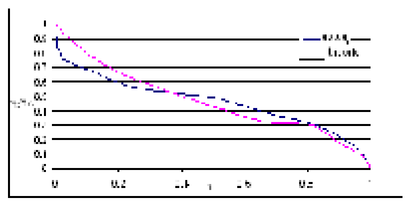

Fig4:Actual and Theoric Dimensionless hypsometric curves(Vazneh)

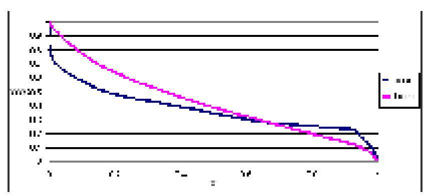

Fig5: Actual and Theoric Dimensionless hypsometric curves(Baneh basin)

Referenace

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