International Journal of Universal Print
ISSN: 2454-7263 ID: ACTRA 2018 015 Published Mar. 2018
Volume No. 04, Issue No.02, Copyright © Universal Print
Web: www.universalprint.org , Email: ijup@universalprint.org
Title Key: STUDY OF GEOLOGICAL CONTOURS OF …

STUDY OF GEOLOGICAL CONTOURS OF KHULTABAD AND CHALISGAON HILLY AREA AND THEIR FRACTAL NATURE

S.Q.Chishty[1] and Mhod Khizar[2]

Department of Physics, Dr. Rafiq Zakaria College for Women Navkhanda Aurangabad M.S
Email: chishtysq@gmail.com

Department of Physics, Kohinoor College of Arts Science and Commerce Khultabad. M.S
prof.khizersayeed@gmail.com

ABSTRACT:

In the present study contours from local hill area Kultabad tehsil of Aurangabad district Maharashtra. And hilly area 'Chaalisgaon' area in Jalgaon district(M.S). These contours are plotted by taking the scale as 1 cm = 500m. using leveling instruments. The contour shapes are studied with reference to the fractal geometry. As the contours are closed forming irregular shapes these shapes are digitized and analyzed using the box counting technique. Their fractal dimensions are calculated.

KEY WORDS: Box counting, Contours, Dimensions, Fractal.

1.0:INTRODUCTION:

There are many geological applications of fractal theory, which remained unanswered by the regular geometry known as Euclidean geometry. Shapes of mountains, earthquakes and seismicity and tectonics frequency size of rock fragments, volcanic eruptions, mineral deposits, oil fields etc. are examples of scale invariant in geology [1] the applicability of power law statistics to geological phenomena was recognized long before the concept of fractals was conceived. An example is Gutenberg-Richter relation for frequency magnitude statistics of earthquakes [2]. It is now accepted that relationship is equivalent to a fractal with dimensions typically 1.8 for distributed Seismicity. Mandelbrot (1982) has used the fractal concept to generate synthetic landscapes that look similar to actual one. The earth's topography is a

International Journal of Universal Print
ISSN: 2454-7263 ID: ACTRA 2018 015 Published Mar. 2018
Volume No. 04, Issue No.02, Copyright © Universal Print
Web: www.universalprint.org , Email: ijup@universalprint.org
Title Key: STUDY OF GEOLOGICAL CONTOURS OF …

composite of many competing influences. Topography is created by tectonic processes by erosion and sedimentation. There is considerable empirical evidence that erosion is scale invariant and a river network is classic example of fractal tree [3-4].

Many geophysical data sets have power law spectra. These include surface gravity and magnetics as well as topography. Since power law spectra are defined by two quantities, the amplitude and slope these quantities can be used to carry out textural analysis of data sets [5-6]. The fractal structures can also be used as basis for interpolation between tracks where data have been obtained.

1.1: SEISMICITY AND TECTONICS:

It is observed that in many plate tectonics the deformations takes place at the boundaries between the major surface plates. In the idealized model plate boundaries are spreading centers subduction zones and transform faults[7-8]. Displacements across these faults would be associated with recent great earthquakes as in Maharashtra (Killari) and Gujrat . The earthquake model is a well studied for the determination of frequency of earthquakes.

1.2: LANDSCAPES AND RIVERS:

The mechanism responsible for the landscape evolution are scale invariant but it does not constrain the mechanism. The primary mechanism responsible for the evolution of topography is erosion. There are several aspects of erosion. The first is the development of soil and rock fragmentation through a combination of chemical and mechanical weathering the soils and rocks. Fragments are then transported as sediments in rivers and streams. The rivers and streams themselves erode channels and gullies to form drainage patterns[9]. Under many circumstances drainage patterns also yield fractal statics.

1.3: WHAT IS CONTOUR:

Contours may be defined as the lines of intersection of a level surface with the surface of the ground. The elevation and depression of the surface of the ground are shown on a map by means of contour lines. All points on any contour line have same elevation above the datum surface. The line joining these points on the map is known as a contour line. [10]

The horizontal distance between any two consecutive contours is known as the horizontal equivalent. It depends upon the steep-ness of the ground. The contour intervals depend upon (i) nature of ground (ii) the purpose and extend of survey (iii) scale of map.

1.4: CHARACTERISTICS

The contour line closed together near the top of a hill and wide apart at the foot of a hill. A uniform slope is indicated when contour lines are uniformly spaced. Contour lines crosses ridge line or valley line at right angles[11-12]. A ridge line is shown when the higher value are inside or bent into loop while in case of the valley line the lower value are outside the loop or bent.

2.0: METHODOLOGY:

Following method is adopted for drawing

2.1: DIRECT METHOD:

In this method the actual contours located on ground by marking the points on each contour. These points then used to mark and plotted on the plan. The method is very slow and tedious but most accurate and used for contouring small areas.

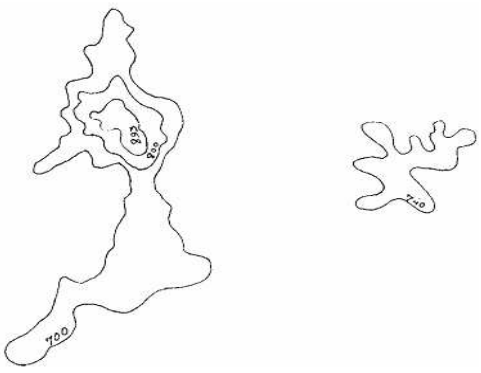
2.2: CONTOUR DRAWING:

Contour lines are drawn as fine smooth freehand curved lines of the uniform width, these should be inked

International Journal of Universal Print
ISSN: 2454-7263 ID: ACTRA 2018 015 Published Mar. 2018
Volume No. 04, Issue No.02, Copyright © Universal Print
Web: www.universalprint.org , Email: ijup@universalprint.org
Title Key: STUDY OF GEOLOGICAL CONTOURS OF …

black. Figure (value of contour) should be plotted nearly under each other or better still along a curve intersecting the contour at right angles and they so written that they can be read from one or two sides of the map. They should be written at the beginning middle and end of the contour lines.

The same contour appears on either side of a ridge of a valley. In valleys the contours upstream on one side and after crossing the stream return down stream on the other. Contour lines cannot merge or cross to one another on the map, except in case of over hanging cliff. The contour lines cannot end any where but must close on themselves within or without the limit of map. A series of close contours on the map indicated a depression and a hill accordingly as the lower and higher are inside them.



(a) Rasulpura Hills (b) Sirha dongar

Fig. 1: (a, b) : Contour from Satara hills (Khultabad tahsil) scale 1 cm = 500 m

3.0: SELECTION OF CONTOURS AND CALCULATIONS:

We studied the contours from local hill area known as “Sir ha Dongar’ and ‘Satara hills’ in Kultabad tehsil of Aurangabad district. From ‘Chaalisgaon’ area in Jalgaon district.

These contours are plotted by taking the scale as 1 cm = 500m. The figure 1

(a, b) demonstrate the contours at different mean sea levels (MSL) at Karachi[13]. The contour shapes are digitized and analyzed using the box counting technique. Their fractal dimensions are calculated as 1.91, 1.92, respectively. Figure 2 show the plot of Log(r) Vs Log (n) for the contours of figure 1. [14-15]While Figure 4 show the plot of Log(r) Vs Log (n) for the contours of figure 3.[16]

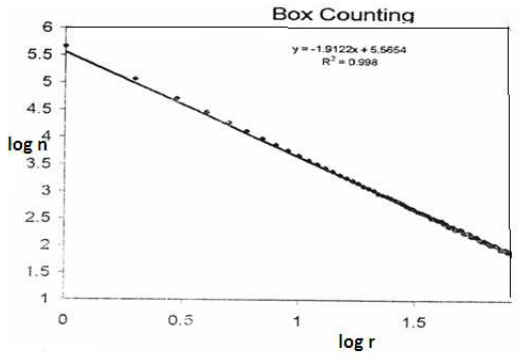


fig: 2 : Graph of Log(r) Vs Log(n) for the contours of fig 1

International Journal of Universal Print
ISSN: 2454-7263 ID: ACTRA 2018 015 Published Mar. 2018
Volume No. 04, Issue No.02, Copyright © Universal Print
Web: www.universalprint.org , Email: ijup@universalprint.org
Title Key: **STUDY OF GEOLOGICAL CONTOURS OF …**

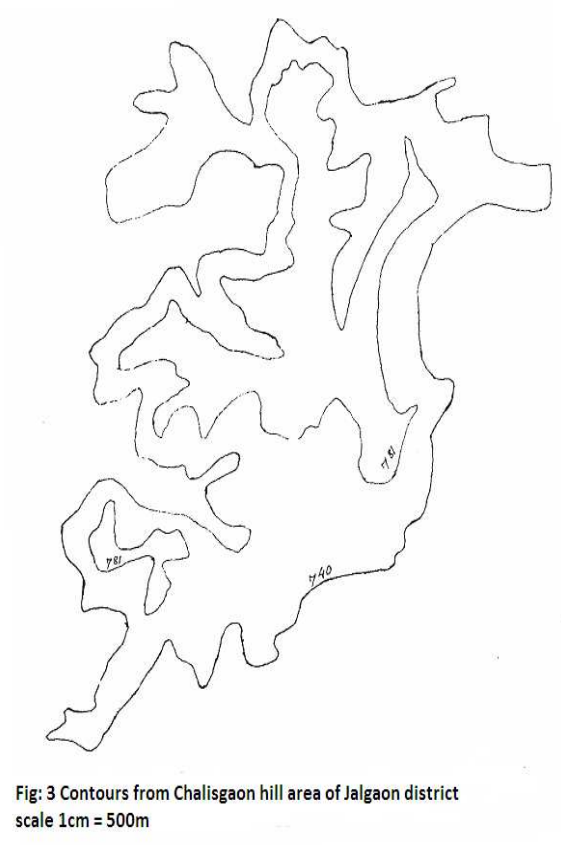


Fig: 3 Contours from Chalisgaon hill area of Jalgaon district
scale 1cm = 500m

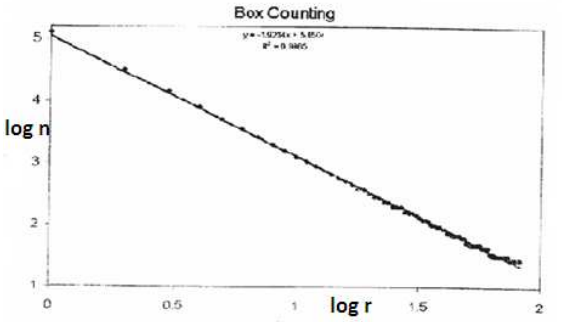


fig.4: graph of log r vs log n for the contours of fig . 3

CONCLUSION:

In the experimental approach we studied contours of some nearby mountains. Generally contours are continuous and not necessarily close. Therefore we selected particular mountains and their contours are plotted and fractal dimensions are calculated with the help of box counting method. Fractal dimension so calculated are close to plane but are not perfectly dimensions of plane it is interested to see that dimension are nearly 1.91,1.92 or so This study will help geological survey and to will develop insight about the mountain patterns across the world.

REFERENCES:

[1] Vicsek Tama's 'Fractal Growth Phenomena' world scientific Singapore (1992).

[2] Chishty S.Q Mazahar Farooqui et al "Fractal aggregation of Copper Particles" Oriental J. Of Chemistry,Vol.29 pp.1183-1186 (2013)

[3] Chopard, B; Herrmann. H.J. and vicsek, T; nature (1991).

[4] Witten, T.A; and Sander, L.M; Phy. Rev. Lett. 47, 1400. (1981).

[5] Chishty S.Q; 'Studies in Fractal And Diffusion Limited Aggregation Phenomena' A Ph.D Thesis Dr. B.A.M. University Aurangabad (2002).

[6] Meakin, P; J. Colloid Interface Sci. 105,240 (1985 b).

[7] Patil, A.G; 'Studies in Fractal Growth Phenomena' A Ph.D Thesis Dr. B.A.M. University Aurangabad (2001).

[8] Chishty S.Q Mazahar Farooqui et al "Fractal Deposits on lime stones" Journal of Chemistry,Vol.29 pp.1183-1186 (2013)

[9] Fedder, J; Fractals, Plenum Press, New York P.283 (1988).

[10] Haung, J and Turcotte, D.L; Geophysics Res. Lett. 17,223 -6(1990).

[11] Dz icwo no k i, A.M; Ekstrom G; Woodhouse, H. and Zwart, G. Phy. Earth planet. Inst. 54,10-21 (1982).

[12] Hack, 1. T. U. S Geological Survey professional paper 294 B, 97, (1957).

[13] Chisty S.A; Studies in Contour Drawing and Survey, a Theory file, Technical education Aurangabad (1963).

[14] Gilbert, L; E. 'Are topographic data sets fractal?' pure. Appl. Geophys. 131, 41-54 (1983).

[15] Vicsek T, 'Fractal growth phenomena world'scientific Singapore (1992).

[16] Masters, B.R; Family, F. and Platt, D.E; Invest. Opthalmol. Vis. Sci. (suppl.) 30, 39 (1988).