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Measurement of Height and Satellite Imaging of 'Siddh Baba Hill' at Manendragarh, Dist. Korea, C. G. India.

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Abstract

An exploration was conducted for measurement of height of Siddh Baba Hill (SBH). It is 130 Km away from the Dept. of Botany, Ambikapur, in west direction, on national road high way N^{o} NH -78 at the divergent of state highway SH- 8. The geological position of Siddh Baba Hill' is 23^{0}20'39.27'' N latitude, 82^{0}19'50.26'' E longitude beside Manendragarh city, at south side at 0.5 Km distance from railway station, Geomorphology of Siddh Baba Hill is studied and the height of SBH is measured with manual meter scale, trigonometry, altitude readings and index contour lines of terrain feature in its satellite map.

Key words

Mountain logy, Siddh Baba Hill, Altimeter, Satellite imaging, Terrain feature,

Introduction

There is a beautiful scenario of the earth, at about every 50Km, there is presence of river, rivulet, mountain, hill, hillock, uplands and ponds. The mountains and rivers are associated with their own ethics and have a history with human society. (1, 2)

The geodetic determination of mountains height, since the time of the inauguration of improved procedure, was made by the Franciscan Father Louis Feuillée in 1724. With a chain of 60 feet, he measured a base line pointing toward the center of the mountain, and 210 toises [409.3 m]. He measured with a quadrant, the elevation of the Peak at end from the base in length - line. From these data he calculated the height of the Peak above sea level to be 2213 toises [4313 m]. (2, 3)

Heron in 1751, measured height of a wall and mountain when its distance from the observer is known. Heron's process of measuring the distance from base to an unapproachable peak point B, where the distance measured by rods and the distance A B is calculated by similar trigonometry. (4)

In Italy, Blancanus determined the height of Monte Baldo from lake Garda, The elevations taken at Parma with dioptric instruments, He measured the height of Monte Baldo 804 passus of 5 Bologna feet each [1528 m]. The modern figure is 2095 m. In England, Edward Wright (1589), measured a hill near Plymouth Sound observing certain angle, and resulted that this hill was 375 feet above the sea. (5,6)

In the measurement of the height of the hill, Hipparchus, used trigonometry to measure an acute angle and a side of one right triangle and then calculated the required side. He worked on necessary trigonometric ratios corresponding to the modern sine, cosine or tangent. Also, By using two similar triangles, geometers performed their results without angles readings , by using only the *lengths* of sides (7)

Akhouri Sinha studied a mountain in Antarctica in the United States, explored in 1971-72. As a professor in the Department of Genetics, Cell Biology at the University of Minnesota, Sinha was a member of a team that catalogued population studies of seals, whales and birds in the pack ice of the Bellingshausen and Amundsen Sea and Glaciers in 1972 and 1974. He was recognized by the US Geological Survey, which named the mountain Mount Sinha, It was measured 990 m by him at the south-east extremity of Erickson Bluffs in the south part of McDonald Heights and Kirkpatrick Glacier from the north in Marie Byrd Land. (8).

Author visited Lyon city for conference participation MS'04 in France. To the west of Lyon city there is a Hill Fourvière, known as "*the hill that prays*". A funicular (a railway on about 45^0 to 50^0 steep hill) made for prayer in famous church .To the north; there is the Croix-Rousse, known as "*the hill that works*". (9, 10, 11) La Croix-Rousse is a hill in the town of Lyon, France, as

well as the name of a quarter located on this hill (divided into two halves - the *pentes*, a part of the town's 1st_arrondissement, and the plateau, in its 4th_arrondissement). It is 254m at its peak. It is near the Place_des_Terreaux. It is 254m at its peak. It is near the Place_des_Terreaux. La Croix-Rousse is nicknamed "*la colline qui travaille"* (the hill that works) in contrast to the better-known hill to the southwest, Fourvière, which is known as *la "colline qui prie" i.e.* the hill that prays.(6) The highest peak ever reached is Cime de la Bonette-Restefond (2,802 m = 9,193 ft),The highest mountain finishes in the history of the Tour were Val Thorens (2,275 m =7,464 ft) in 1994; previously this had been Col du Granon (2,413 m=(7,917 ft) stated in 1986.(12,13).Consequently, height measurement is concern everywhere.

Siddh Baba Hill has geographical importance in Manendragarh area in CG, India. But its height was not yet measured. Objective of the paper is to measure the height of Siddh Baba Hill located in Manendragarh CG India, by ground observation , trigonometric calculation and satellite contour map reading along with altitude readings with an altimeter.(14,15,16)

Fig1 is a photograph of SBH taken from railway line at its knee position in eastside. A cave, in the center of SBH, is found as depicted in fig.2. Here 'Ascetics' meditate, therefore, foot path may seen in summer but not in rainy season, due to growth of local common weeds *i.e. Lentana camara* and *Xanthocarpum strumarium* .West-north side of the hill is represented in fig.3 and fig,4 represents the photograph taken from top of SBH to its bottom, where rail is seen passing for MDGR city.

Fig.1.SBH east

Fig.2 SBH, closer

Fig3.SBH east-north side

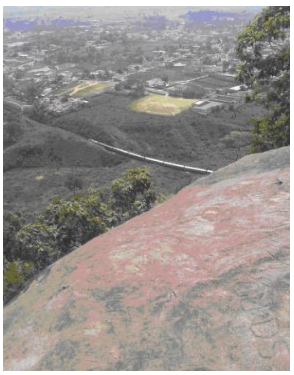


Fig.4 SBH top north

Methodology

At the top of hill there is a temple of Lord Shiva surrounded by rocks. A large rock shown in fig.4 is observation point 'O'. The manual measurement is done using rope and weight system.

At the tip of rope a 500 gm weight (plum) is fixed, then from top is put down to weight full end into the bottom , at 90^0 steep of the hill . The depth of vertical steep from vertex is assumed as height, and later, the length of rope is measured with meter tape. The hypotenuse of hill is estimated by walking feet number count into average walking feet distance. Also Pythagoras theorem is applied for trigonometric calculation in the height measurement of SBH. An altimeter and GPS data is downloaded along with mobile data (17, 18) in Samsung (DUDS) and altitude readings and contour readings from satellite imaginary mapping has been applied (19)

Construction of temporary slope meter (clinometers)

Clinometers is constructed by following simple methodology (20) , using a triangle shaped meter scale (from middle school compass box), fine strong tread, seizer and fixative (feviquick) .Authors here used a steel needle pointer instead of plum. Fig5 represents constructed clinometers to measure the steep angle of a side wall of road (NH-78).to MP state from Surguja, Chhattisgarh state in India.

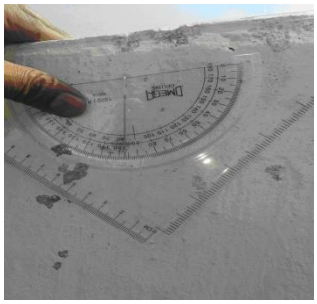


Fig.5.Slopemeter

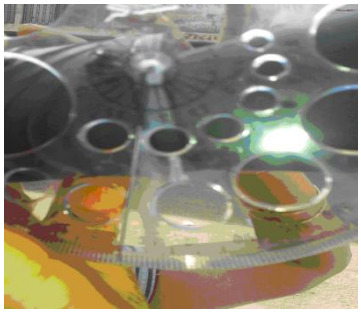


Fig.6 Temporary Sextant

Fig7.Tele-observation

Construction of temporary Sextant

A round angle-meter (circular gonometer) is fixed at centre, with a long steel needle's pointer to be pendulum, then it is fixed with telescope in such a way that at horizontal position of telescope pointer would pass vertically at 0^0 of the Sextant (21) .A telescope (model-Comet, 7x50 LER 1000 YD 119 A1) is used to make a sextant apparatus to find the angle at top of the hill, and from the top to bottom. Fig 6 represents a temporary sextant and fig.7 represents observation from top of SBH to the railway bridge.

Fig.8. Observation at Peak Fig.9 Temple at peak Fig 10 Rail line Fig. 11 Bottom of bridge

Co-author observed railway line and Manendragarh city from top of SBH, is represented by fig 8. Manual height measurement is done by dipping method using weight attached to the rope. The temple at the top of SBH is shown in fig 9. Fig 11 represents the bottom of SBH and SBR below the railway line passing through SBH cutting at knee position is depicted in fig 10. The South eastern railway line passes beside SBH at east side slope, to Chirimiri Colliery by cutting the slope of SBH .There is a bridge on 11.52 m. deep rivulet "Siddh Baba Rivulet' (SBR) is present. Its origin is below north-west foot of SBH. It rotates in foot of SBH from north flowing to eastward below Railway Bridge. It is ever flowing rivulet of 03 km length; it confluent with Hasia rivulet and then, it is contributory to Hasdo River.

1. **Manual measurement of height of Siddh Baba Hill (SBH)**

1.From the observation point, O, to the plum stopped terrace point 'T' (parallel to base of the cave) of SBH (at 90^0 steep) = 145m.

2.From the observation point O, to the Top of SBH (Temple)OP = 4.5m

3.From terrace point T to Railway Line (SECR) bridge (Lower Observation Point) L = 110.50m

4.Depth D. of the Railway bridge on Siddh Baba rivulet LD= 11.52m

(*i.e.* Plum line length + thread line length + wall's height between bridge B and Rail line L = 1.44 + 07.72 + 2.36 = 11.52)

Total height of SBH = summation of above points, 1+2+3+4 = OT+OP+TL+DL

=145+ 4.5+110.5 +11.52 =**271.52 meter**

From Railway line level =**260m.**

2. Altimeter readings using GPS data in Samsung duds mobile

Fig 12-15 represent altitude readings, respectively below SBR (Bottom) D ,at railway line on the SBR bridge L, at the top of SBH, O and at the another ridge of SBR rivulet north side (city side) opposite to SBH. The sun light caused brightness on mobile altimeter, Hence pointer can be observed.

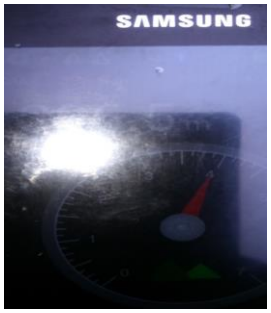
1.At the bottom of Siddh Baba Rivulet, Altitude= 396.2 m.

2.At the Railway line level on the Siddh baba Rivulet bridge, Altitude = 406.5m

The height of SBH from Railway line level = 586.3 - 406.5 = **179.8 m**

The height of SBH from the bottom of SBR rivulet = 586.3 - 396.2 =**190.1 m**

190.1- 179.8=**10.9m** is the height of railway bridge on SBR rivulet



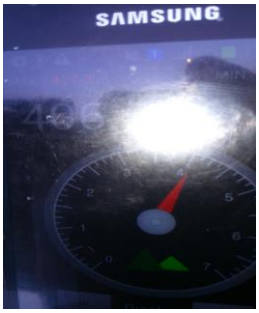


Fig.12. Altitude at D **.13** Altitude at L **Fig 14** Altitude at O **Fig15** Altitude of right ridge of SBR

3. Trigonometric calculation of height of SBH

1**.** Hypotenuse of Siddh Baba Hill on south-east side (from top of Siddh Baba Hill to North JKD-Medial School) = 29160 Cm =291.60 m = 0.291 Km

(Average hypotenuse may be 174 +291 = 465/2= 232.5 m=0.232 Km. But a particular hypotenuse is applied at an angle of observation)

If SBH is assumed some conical shape, so that the radius of base of cone is assumed equal to the distance from Railway bridge on Siddh Baba Rivulet (below hill at 80^0 steep. L point) to North JKD Medial School"A" where the top of hill is 37^0)

2. The distance from Railway bridge on Siddh Baba Rivulet (below hill at 90^0 steep. L point) to North JKD Medial School "A".) = 12636 Cm. = 126.35m = 0.126 Km

Following the theorem of *"Pythagoras of Samos"* (22)

i.e. Base ^{2} + Perpendicular^2 = Hypotenuese^2

$A^2 + B^2 = C^2$ Or $B^2 = C^2$ ---- A^2

$B^2 = (291\ m)^2 - (126\ m)^2$

$B^2 = 84681 - 15876 = 68805$

Therefore B = 262.30 m , Thus the height of SBH= **262.30 m**

Angle reading in sextant from High School , North Jhagarakhand , from old railway line level to the peak of SBH= 37^0

Sine Ø = Perpendicular / Hypotenuse

Perpendicular = Hypotenuse x Sine theta

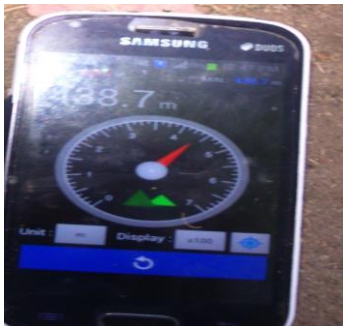
Here, Sine Ø = Sine 37^0 = 0.60 (From Rapid Calculator.com)

So perpendicular = 291 x 0.60 =174.60m.

It is the height of Siddh Baba Hill =**174.60m**. from North Jhagrakhand school level.

Fig.16 represents reading of mobile altimeter showing an altitude 438.7 m at Middle School of North Jhagara Khand Colliery (NJKD). The difference between altitude of SBH top and NJKD at south east foot of SBH is the height of SBH from this level. From North Jhagarakhand the height of SBH = 586.3-438.7=**147.6m** while, Sin Ø calculation is **174.60m**.

Fig.17 represents, 502.7m altitude in west of SBH, at the starting point of the path to go temple at the top SBH from NH78. Height from this level is 586.3- 502.7= **83.6 m**. Since it is minimum height of SBH from this side, therefore the path is made to visit Siddh Baba Mandir on SBH as depicted in Fig21 street map. Fig.18 shows altitude 461.2 below of SBH slope on NH78. From north west the height of SBH (from NH78) 586.3-461.2= **125.1 m.** and the height of steep of NH 78 is 502.7- 461.2 =41.5 m.



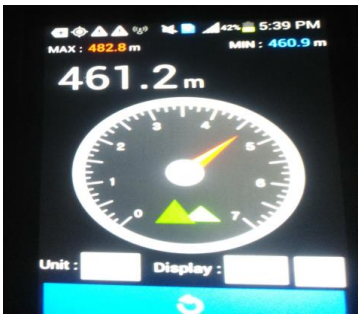


Fig.16.Altitude at NJKD **Fig.17Altitude at path from NH78** **Fig.18 Altitude below slopeNH78**

Fig.19satellite imaginary **Fig.20 Index terrain feature** **Fig.21street map**

Fig 19, Fig 20 and Fig 21 represent images of SBH collected by satellite. These are topographic maps from wave sites seen upper view. Satellite imaginary is geographically representation and an index terrain feature has contour line of the points of same elevation. Smallest enclosed circle is the peak or the top of SBH. It is the observation point, at which Siddh Baba Mandir (Temple) is seen in street map. Just out of this, adjacent contour line is marked 600m elevation, there are many contour lines enclosing other lines representing SBH.

The right side of index terrain feature, there is a cleft of SBR rivulet and very nearer, enclosed contour lines show most steep, therefore, there is no path from this side, since, the elevation changes much quick. These very enclosed contour lines represent a cleft for SBR rivulet. The city side upland of SBR rivulet making north side high peak is denoted by most outer contour line, at this contour feature, altitude is 437.3m at north side upland of cleft of SBR rivulet i.e. Manendragarh city side. In most inner contour line is the elevation of the bottom of SBR rivulet is 400m. Altimeter reading is 396.2 m. at bottom of cleft (rivulet) and at the Railway line level, elevation is 406.5m.

In the left upper side of index terrain feature (west JKD side) where the contour lines are spread to show minimum steep, therefore from this side a path is seen in street map to reach Siddh Baba Mandir (Temple), situated at the peak. Outer most contour index is marked 500m**.** At the point of start of path from NH78, also the Altimeter reading is **502.7m.** There fore longer distance is travelled by this path for Temple, as contour line is also most farer to each other. So that it is minimum steep, easy to ascent.

The right upper, the index terrain feature is north side NH78, has a steep of 41.5m. While, just upper adjacent contour line than railway line level contour line index is 500m . is In right of hypotenuse of Siddh Baba Hill on west side from road NH 78 to the top of SBH = 17,496 Cm = 174 m = 0.174 Km. It is very low steep (07.5^0) seeming horizontal. Therefore, this hypotenuse is not applied for height of the hill. Since before steep of NH78 altitude is 461.2m and after at the point of start of path for SBH, altitude is 502.7 m thus, 502.7- 461.2 =41.5 meter is steep of road .

The lower index terrain feature is south side but called North Jhagarakhand , Since it has SBH of its north , at Middle School, the road is being constructed to reach to the peak of Hill. The elevation in altimeter is recorded 438.7. thus, the height of SBH = 586.3-438.7=147.6m

Result and Discussion

Table 1 represents measurement of height of Siddh Baba Hill from various points of observation and various methods applied . An average value of the measured heights by various methods might be considered as an actual height.

There fore the height of SBH = (271.52+190.1 + 250) / 3 = 711.62 / 3

= **237.2 m** from Bottom of Rivulet below it.

And from Railway line level on bridge of SBR the height of SBH is

(260+262.3+179.8+200) /.4 = 902.1 / 4 = 225.52m

Google map in internet provided by satellite system shows that in map, One may found Siddh Baba Hill through steps. Firstly searched India, then Jabalpur and just right of Jabalpur, Manendragarh is found. Although, smaller places like Ram - Nagar and Dola are appeared in map before Manendragarh. Siddh Baba Hill is located at the meeting place of NH 78, SH 8, and Indian Railway (Chirimiri-Anuppur) Line. It is surrounded by North Jhagrakhand, West Jhagrakhand and Manendragarh. GPS field area measurement contour lines reading is 500m at

surface line and 600m at just outer circle of smallest contour circle at peak of Siddh Baba Hill. The bottom of Siddh Baba Hill is the bottom of Siddh Baba Rivulet is 400m. Thus the height of SBH might be estimated 250m in satellite index contour feature. and an average height is considered actual height *i.e.*237.2m.

Table 1. Measurement of the height of Siddh Baba Hill (SBH)

Sr. No	**Observation point**	**Manual Meter scale**	**Trigonometric measurement**	**Altimeters reading**	**Contour Reading**
1	Bottom of SBR rivulet	271.52 m	X	190.1m	250m
2	Railway line level On SBR rivulet bridge	260.0m	262.3m	179.8m	200m
3	North JKD Middle school	X	174.6	147.6m	200m
4	At NH 78 (New 43) at start of path to Peak	X	X	83.6m	100m
5	At NH 78 (New 43) below the slope of SBH	X	X	125.1	150m

There is a variations in manual measurement , Trignometric calculation , altimeter reading and index contour values. This might be due to difference between air distance and ground measurement . Since distance of hypotenuese is estimated by walking foot count and rough path having stones and irregular curves may make differences in distance. Surprisingly, a contour index value is marked 600m at just outer contour line of smallest contour circle at peak. Thus , at the peak , smallest contour should be more than 600m But altimeters reading shows 586.3m. A simple cause might be that an altitude in index contour feature, is taken from very far distace , from satellite and in altimeter , altitude is an elevation from sea level, satuated in much distance , Map - hill is the most comprehensive map gallery on the web. Map Mart offers a variety of high, medium and low resolution satellite imagery data sets for nearly every location on the earth. Our unique interface allows to submit area of interest and get a comparison of all imagery including,

geographical data (24). Baoridand hillock is very near (06 Km) to SBH, in north direction. Below this hillock there is a smallest railway junction of South Eastern Railway in terms of number. of travelers, wages and comfort.

There is further scope of this study for ecology of hills forests, *e. g.* Siddh Baba Hill surrounding forest in JKD area, (in both CG and MP, being border),. There is a rich biodiversity, including agricultural, domestic, fresh running and stagnant aquatics, lichens and forest lives with a good ecological association. It is habitat of *Urses urses*, (black Indian bear), struggling with human society A conflict occasionally has been observed with human *ditto* as an elephant problem in Surguja Dist. and snake problem in Jashpur Dist. in CG India.(23). In Earth Science, there is a scope to study supplementary contour lines and stages of origin and erosion of SBH.

Conclusion

The height of SBH is measured 237.2 meter from the bottom of SBR rivulet of its origin and its height from Railway line level is 225.52m. It is very nearer to contour reading of satellite map. and an altimeter reading *i.e.* altitude, an elevation from sea level . The Satellite imaginary and GPS Data like advance technology make interesting and easy to study mountains.

Acknowledgement

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