VOL- VIII ISSUE- V MAY 2021 PEER REVIEW e-JOURNAL IMPACT FACTOR 7.149 ISSN 2349-638x

Study of Long Profile and Cross Profiles of Upper Kundalika River Basin, Dist. Raigad, Maharashtra

Dr. H. D. Wagalgave,
Shevneri Mahavidyalaya, Shirur Anantpal, Dist-Latur,
Mr.S. K. Pise,
Annasaheb Vartak Mahavidyalaya, Vasai Road West, Dist-Palghar.

Abstract:

The longitudinal profile characterizes average stream slopes and depths of riffles, pools, runs, glides, rapids and step/pools. The average water surface slope is required for delineating stream types and is used as a normalization parameter for dimensionless ratios. The water surface slopes of individual bed features (facet slopes) can be compared using longitudinal profile data (e.g., riffle facet slope vs. pool facet slope). In addition, the longitudinal profile can be used to obtain maximum depth of individual bed features and bed feature spacing. In the Upper Kundalika river basin we have plot the five cross section profiles in the different part of the watershed. River cross profiles show you a cross-section of a river's channel and valley at certain points in the river's course.

***Keywords**: long profile, cross profile, river watershead.*

Introduction:

This river The latitudinal extent of the study area of Upper Kundalika basin is 18°20'North to 18°35'North and longitudinal extent is 73°40'East to 73°11'East. This area coverd in the SOI toposheet no 47F/3, 47F/6 and 47F/7. The Upper Kundalika maintains fairly straight course in E - W direction up to Roha and then follows as SE-NW trend. The Upper Kundalika is a small river flowing from the Hills of Sahyadri to the Arabian Sea. The distance of the Upper Kundalika basin is 42.5 km and total area coverd by this watershed is 356.74 sq km. originates to the West of at small town called Bhira in the Indian State of Maharashtra, 150 km south east of Bombay (Mumbai).The important towns located on the banks of Kundalika are Kolad, Korlai, Chaul, Roha and Salav. River Kundalika is fed by the excess water from Tata Power's Mulshi Dam Project on to a series of hydroelectric projects and dams, including Ravalje followed by Bhira and then Dholvan, where the water is released in the morning typically at 6 am. The gush ofthe water reaches Sutarwadi at 7:30 am and water rises at Kolad at 10:00 am. There exist a historical Trade Route called Savalya Ghat which descends down in Kundalika Valley from Tamhini Ghat Road.

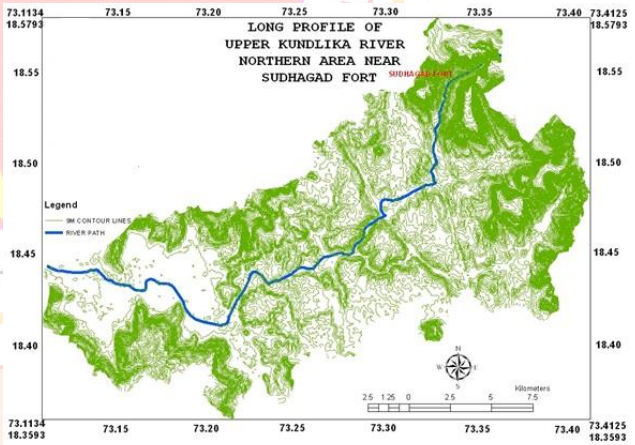


Fig no: 01

Longitudinal profiles have interested many authors especially with regard to understanding their evolution and finding the most pertinent ways to predict their development. We could say that the most prolific period in the study of the longitudinal profiles was during the fifth and sixth decades of the 20th century, when many problems related to the form of longitudinal profiles and to the causes of their development were explained and researchers even tackled the problem of a rational description for them (Shulits, Yatsu, 1955; Hack, 1957; Brush,

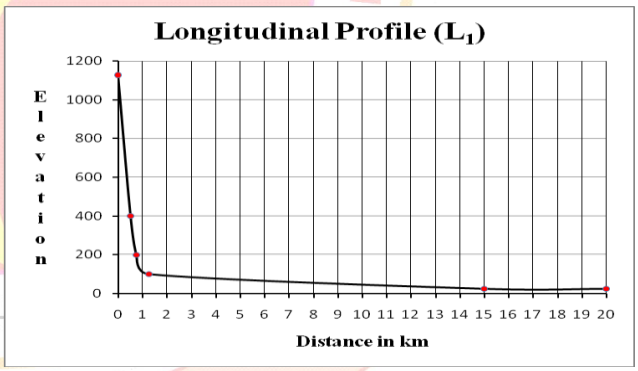
1961; Ros u, 1967; Gruma zescu, 1975). After a relatively ‘‘calmer’’period, the study of longitudinal river profiles was resumed, with new arguments and new research methods in the 1990s (Snow and Slingerland, 1987; Ohmori, 1991; Scheidegger, 1991; Rhea, 1993; Morris and Williams, 1999). The most striking phenomenon related to longitudinal profiles is their form. The plotting of these profiles shows altitude against distance downstream. The resulting form is a curve, more or less regular, the concavity of which increases towards the headwater area. This is their most obvious and persistent feature regardless of the climatic conditions, the length of the river or the rock cut by the riverbed. The attention here is focused on stream profile concavity, partly because it is assumed to be ‘‘. . .so common as to be almost universal’’ (Rubey, 1933, quoted by Wheeler, 1979). So it is only natural that this largely generalized observation be a fascinating subject for research of geologists, geomorphologists, and geographers everywhere. We owe the first pertinent explanation of the form of the longitudinal profile to Gilbert (1877) who, on the basis of numerous laboratory experiments, showed that: the slope of the longitudinal profile is inversely proportional to the discharge. Further studies were concerned with an even greater number of variables which could explain the form of the profile as well as its evolutionary tendencies. Special attention is paid to the effect that the discharge, the characteristics of the riverbed material, the sediment discharge (suspended or bedload), and the type of rock in situ have on the form of the stream bed profile. The conclusion was that the variation of the discharge (Q), the riverbed material diameter (Dmm), and the sediment load (Qs) are the most important in explaining the shape of the profile. All other factors such as rocks of different hardness, tributaries, geotectonic movements, and discontinuities caused by the different stages in the evolution of the profile, account for deviations from the general form of the profile, without fundamentally modifying it. A steady preoccupation for researchers was to find a mathematical function describing the form of longitudinal profiles as precisely as possible, so that there could be a rational basis for palaeomorphological reconstructions and estimates of future evolution tendencies. The most relevant progress was made by referring to equilibrium profiles (so-called graded profiles), which have a smooth curve, without important discontinuities. This is related to equilibrium in sediment transport without steep morphological changes in the direction of the riverbed. Referring to these types of profiles, a variety of mathematical functions has been suggested.

Objectives of the study:

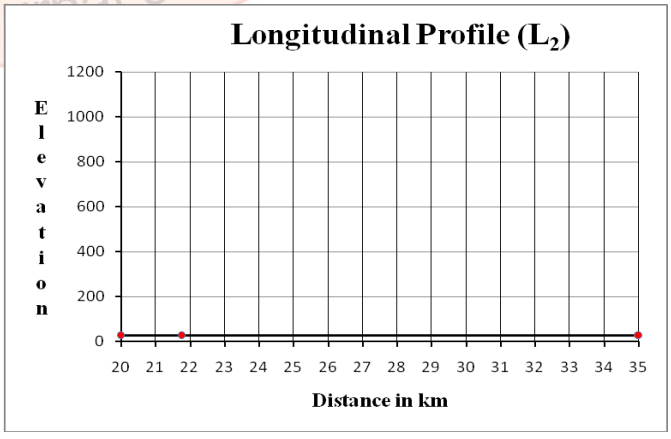
1) To find out the length of upper kundalika river basin.
2) To find and draw cross sections of river for study of river bed and surrounding topography in the study area.

Methodology:

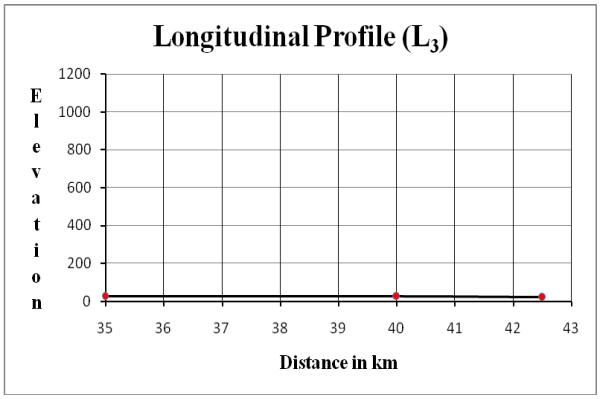
Use topoheet of S.O.I. which scale is 1:50000 for area identification. Use GIS software for mapping and simple graphical techniques use for making the cross profiles. Field visit, field observation and Field survey with Dumpy level.



Graph no: 01



Graph no: 02



Graph no: 03

Total length of this longitudinal profile is 42.5 km. we have divided this into three parts L_1, L_2, and L_3. The distance of L_1 is 20 km which is indicate young stage of river. The distance of L_2 is 15 km this is the stage of river come down in planation region and the distance of L_3 is 7.5 km and stage of rover is old stage because profile indicates completely straight line means that region is very plain. The above long profile(L_1) shows that in the distance 1 to 2 km there are very steep slopes.Which angle is 80º to 85º. At the distance (L_1 + L_2) 2 km to 24km gentler slope will found and the angle of that gentler slope is 25º to 30º. (L_2 + L_3) 24 to 42.5 km there are found average slope which angle is 5º to 7º. In the Upper Kundalika river basin area formation of v shape valleys and channel cutting rate is more in 2 km to 14 km because of slope angle but Unnai dam is one obstacle to direct effect on erosional and cutting process.

Cross profiles:

The cross profile of a river changes as it moves from the upper to lower course as a result of changes in the river's energy and the processes that the river carries out. In the upper course, the valley and channel are narrow and deep as a result of the large amount of vertical erosion and little lateral erosion. The sides of a river's valley in the upper course are very steep earning these valleys the nickname *"V-Shaped Valley"* since they look like a letter V. The river's valley can be anything from a few meters to a few hundred metres in width depending on the lithology but the channel rarely more than 5m or 6m wide.In the middle course, the valley has increased in width due to the increase in lateral erosion but its depth hasn't changed significantly because vertical erosion has slowed down. Similarly, the channel's width has increased but it's still roughly the same depth. The land to either side of the channel in the valley is now the river's floodplain and the valley's sides are much more gentle. In the lower course the valley is now very wide (often several kilometers) and the floodplain has increased greatly in size. The channel is a little wider but not much deeper.

The cross sections of the river:

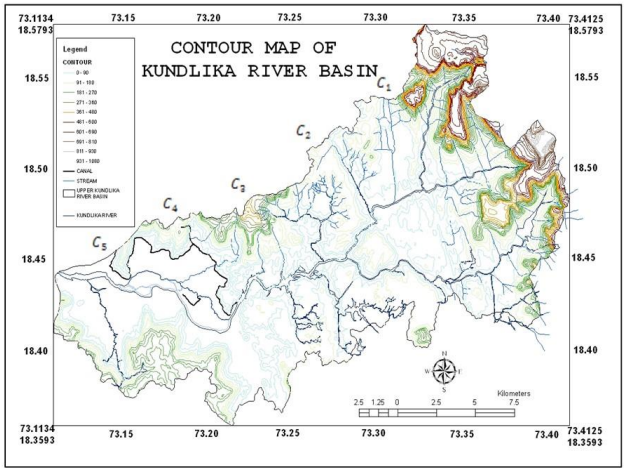
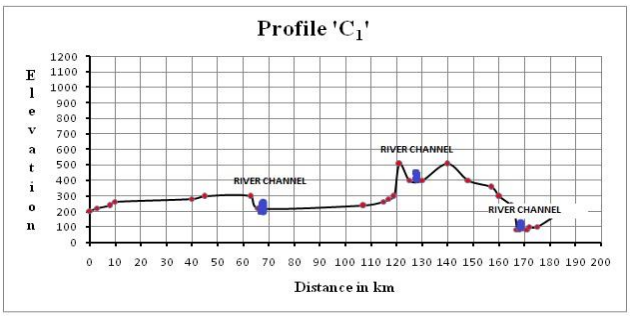
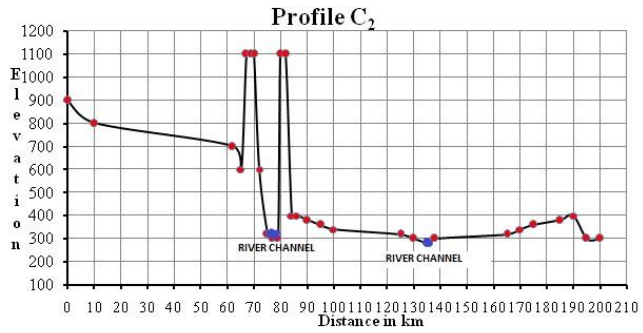


Fig no: 02

In the Upper Kundalika river basin we have plotted five cross profiles. The distance of cross profile 'C_1' is 9.5 km. at the top of mountain the elevation found 1650 feet and at valley bottom it is 80 feet. This profile passes through the village Potlar Bu, Pimpaloli, Nagshet, and Patnus. In that profile there are two peak ranges which elevation is more than 1500 feet. In between 3 to 3.5 km and 6 to 6.5 km 8 to 8.6 km shown very steep slope in this region first ordering streams are present. The basic flow of river kundalika is in between 8.7 to 9 km. this is channel and that elevation is 300 feet.

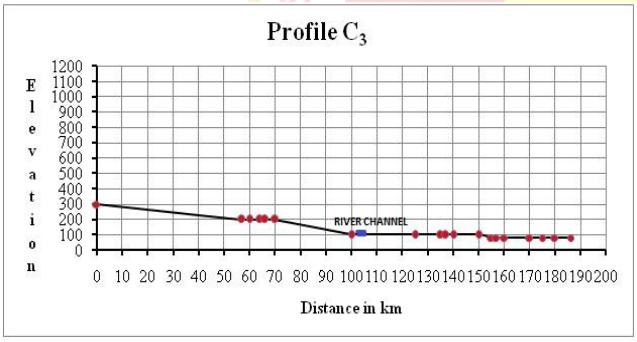


Graph no: 04



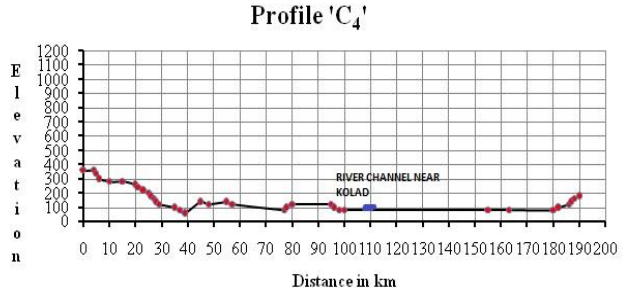
Graph no: 05

The distance of profile C_2 is 10 km. in this profile shown two mountains which elevation is 3300 feet and these are found in between 3 km to 4.5 km in that region very steep slope will found. Sharadwadi, Gondal, Mahasewadi, Sudhagad, Ambevalli are the villages seen on that cross profile at north to south okm to 6 km and 4.5 to 9.5 km the gentler slope will found. At 3 to 5 km there are seen first ordering streams. River bed located 300 feet elevation



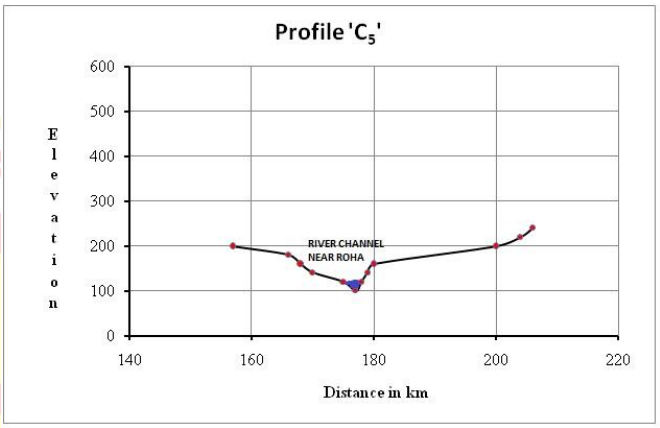
Graph no: 06

This profile C_3 passes Kamatwadi, Turtoli, Durtoli and Sutarwadi villages. At north to south 0 km to 3km no any settlement seen because of steep slope. At the south bank of the river there are plain surface these surfaces found in between 5 km to 7 km and 8 km to 9.5 km. The river bed found at 240 feet elevation above the mean sea level.



Graph no: 07

The distance of that profile C_4 is 9.5 km. in this profile high elevation is 1050 feet local base level is 180 feet. At the north side means watershed border there are very steep slope these slope found in between 0 km to 2 km. this profile passes through Chille, Kudalwadi, Askoknagar, Ambewadi,Kolad and Bhuwn. At the south boundary of the watershed is 750 feet.



Graph no: 08

The total distance of the profile C_5 is 4.5 km. this profile passes Devkaria, Bhane, Ghatav, Barsoli, Ghatao, in this villages. Maximum elevation is 900 feet and minimum elevation is 80 feet at north of the profile very steep slope found in between 0 km to 1.5 km there are gentler slope. The local base level is 80 feet above the mean sea level.

Conclusion:

GIS techniques are very helpful to make and measure of the long and cross profiles of the river. This study is helpful to interpret the distances, river bed morphometry and topographical conditions of the geographical area.

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