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**ON THE LENGTH OF GULLIES IN THE SECTOR
"COLINAS DE BELLAVISTA", ECUADOR**

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The studies were conducted on the territory of the equatorial Andes. The aim of the work was to determine the ratio of gully forms of various lengths on the key section. The authors used field research and the program ArcGIS 10.3 basing on the study of orthophotos. It is established that gully forms with a length of up to 50 m, constituting 37%, prevail. The gullies over 400 m long make only 8% of all erosion forms. Lateral short gullies retain the potential for peak growth as a result of regressive erosion. The work can be used in such scientific areas as fluvial geomorphology and soil protection from erosion.

Key words: erosion forms, equatorial Andes, slop, regressive erosion, morphometric parameters

кандидат географических наук, Кравченко Р. А., Пареха Э .С., Флорес Й. Г., О длине оврагов в секторе «COLINAS DE BELLAVISTA», ЭКВАДОР / Университет УТЕ, Эквадор, г. Кито; Российский государственный гидрометеорологический университет, Российская федерация, Санкт-Петербург;

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Исследования проводились на территории экваториальных Анд. Целью работы было определение соотношения овражных форм различной длины на ключевом участке. Использовались программа ArcGIS 10.3 на основе изучения ортофотоснимков, и проводились полевые исследования. Установлено, что преобладают овражные формы длиной до 50 м, составляющие 37 %. Овраги длиной свыше 400 м составляют лишь 8 % от всех эрозионных форм. Боковые короткие овраги сохраняют потенциальную возможность для вершинного прироста в результате регрессивной эрозии. Работа может быть использована в таких научных направлениях, как флювиальная геоморфология и защита почв от эрозии.

Ключевые слова: эрозионные формы, экваториальные Анды, склон, регрессивная эрозия, морфометрические параметры

Introduction.

Gully erosion is one of the important factors of land degradation. In this regard, it is relevant to study the patterns of development of linear forms of erosion. The length of the gullies is one of the important comparative indicators of the activity of erosion processes.

A number of studies [1 - 5] have been devoted to the study of erosional forms and processes in the territory of the Equatorial Andes.

The study was conducted in the Andes, near the equator, about 00 ° 04 ' south latitude and 78 ° 24 ' west longitude, south of the Colinas de Bellavista sector, Pichincha province. The height above sea level is 2300-2800 meters. The length of the slopes varies from 250 to 950 m. The slopes are steeply inclined and covered with easily eroded sediments, with

separate outcrops of rocks. According to the "Instituto Nacional de Meteorología e Hidrología del Ecuador," the average temperature is 14 ° C. The average annual rainfall is about 600 - 700 mm. Gullied lands are not used in economic activities.

Purpose.

The objective of the study was to establish the ratio of gully forms of various lengths in the study area.

Results.

A count of gullies was performed in the key areas. To analyze the distribution of linear forms of erosion, the ArcGIS 10.3 program was used based on a study of orthophotos provided by the Instituto Geográfico Militar. Subsequently, field studies of the morphometric parameters of the gullies were carried out. A total of 83 gully forms were examined (Figure 1).

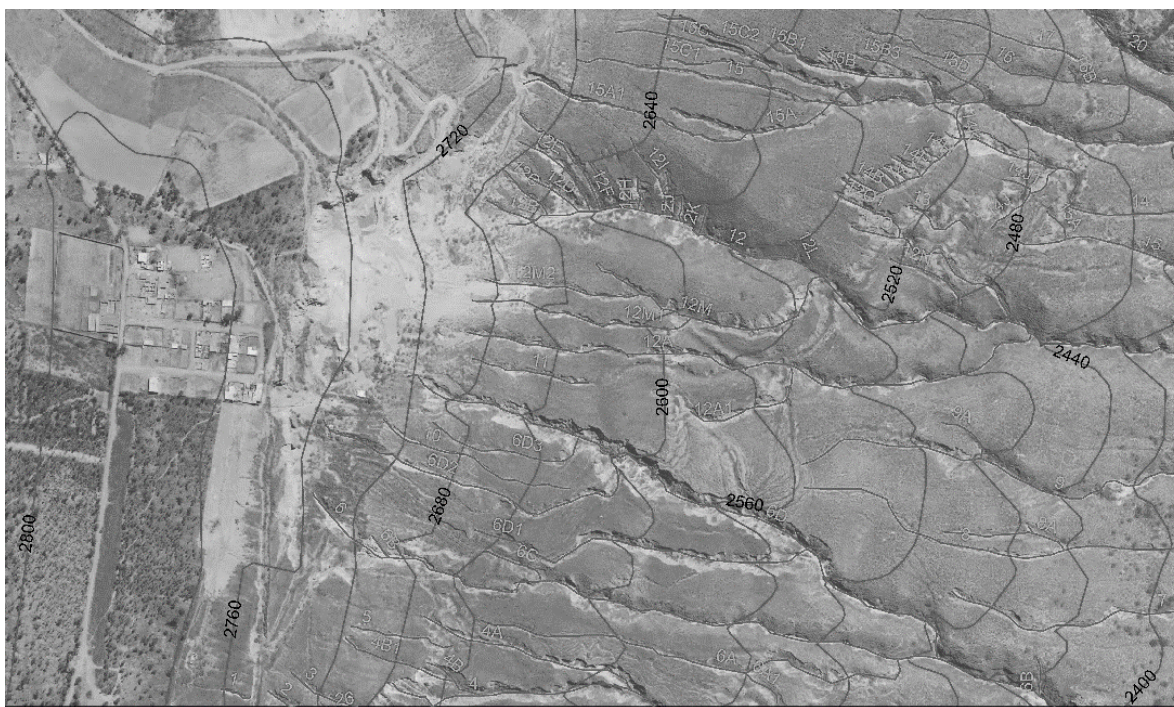


Figure 1 The outline of the gullies

The growth of gullies due to regressive erosion not only leads to an increase in the length of the gullies, but also to the formation of gully systems in which there are many branch-like side gullies coming from the

main trunk of the linear form of erosion. But there have to be certain prerequisites for the formation of branches. First of all, there must be a sufficient catchment area. Therefore, these gullies were treated as independent erosion forms in the analysis. Table 1 presents the results on the number and percentage of gullies of different lengths.

Table 1

The number and percentage of gullies of different lengths.

Gully length (m)		The number of gullies	Percentage of gullies of different length
0	50	31	37
50	100	13	16
100	150	11	13
150	200	6	7
200	250	5	6
250	300	5	6
300	350	1	1
350	400	3	4
400	450	2	2
450	500	1	1
500	550	0	0
550	600	0	0
600	650	1	1
650	700	2	2
700	750	0	0
750	800	1	1
800	850	1	1
more than 850		0	0
Total		83	100

It has been established that most gullies (53%) do not exceed a length of 100 m. At the same time, 37% of all gullies do not reach a length

of 50 m. Linear forms of erosion ranging from 100 to 150 m constitute 13%.

After that there is a significant decrease in the percentage of longer gullies. In particular, gullies with a length of over 150 m constitute 34%. At the same time, only individual erosion forms are found starting with a length of 300 m. Only a few gullies longer than 400 m were recorded. Their share is only 8%.

The longest gullies, as established by field studies, have downworn, turfed tops. They have almost ceased to grow due to regressive erosion. Their tops came close to the watershed line, thereby sharply reducing the catchment area and the potential for further peak growth. At the same time, a number of side gullies remain active and continue to grow. Figure 2 shows a view of the apical part of the lateral gully with automobile tires involved in the transport of water flow.



Figure 2 The apical part of the lateral gully

The greatest changes occur in the rainy period, the peak of which is in the month of April. Whereas in the driest months, from July to September, there is only a transformation of gully forms caused by gravitational processes and repeated sedimentation of solid particles under the influence of a eolian processes.

Field studies have shown that individual gullies can reach depths of up to 20–25 meters or more. Figure 3 shows the mouth part of one of the longest and deepest gullies.



Figure 3 The mouth part of one of the longest and deepest gullies.

Conclusions.

Thus, the studied territory is subject to the active influence of erosion processes, including the development of such linear forms of erosion as gullies. Gully forms with a length of up to 50 m, constituting 37%, prevail. The gullies up to 400 m long make 92% of all erosion forms. Lateral short gullies retain the potential for peak growth as a result of regressive

erosion. The gullies that have a length almost equal to that of the entire slope have stopped their peak growth as a result of a decrease in the catchment area.

The study of the morphometric parameters of gullies in adjacent territories and their comparative characteristics are considered by the authors as significant for the development of the research topic. Besides, the author considers establishing the dynamics of the linear erosion forms development over the past decades similarly relevant for further research.

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