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**THE COLLUVIAL DEPOSITS IN THE GULLIES OF THE NORTHERN PART
OF THE QUITO REGION, ECUADOR**

**КОЛЛЮВИАЛЬНЫЕ ОТЛОЖЕНИЯ В ОВРАГАХ
СЕВЕРНОЙ ЧАСТИ КИТО, ЭКВАДОР**

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Abstract. This study reveals the analysis of the colluvial deposits in the gullies in the Equatorial Andes. The key site is located in the norther Quito suburb. A diversity of widespread colluvial deposits is a specific characteristic of the territory. The analysis showed the coincidence of the soil texture of the gullies and colluvial deposits. The authors came to the conclusion that the studied deposits are lately formed. For being a result of gully sloughing that occurred within the dry season, the deposits are insignificantly converted. The impact of additional factors is considered to be minimal.

Аннотация: Исследовались коллювиальные отложения в оврагах экваториальных Анд. Ключевой участок расположен в пригороде северной части Кито. Для территории характерно широкое распространение и большое разнообразие коллювиальных отложений. Полученные результаты свидетельствуют о соответствии механического состава почво-грунта овражных склонов и коллювиальных отложений. Можно сделать вывод, что изученные отложения были сформированы недавно, в период сухого сезона в результате обваливания, обсыпания пород с овражных склонов и поэтому незначительно преобразованы. Воздействие дополнительных факторов следует считать минимальным.

Keywords: colluvial deposits, gully, erosion, slope, the Equatorial Andes.

Ключевые слова: коллювиальные отложения, овраг, эрозия, склон, экваториальные Анды.

As far as known, colluvium is a general name for loose, unconsolidated sediments that have been deposited at the base of hillslopes (through the action of gravity), slow continuous downslope creep [1, p. 139]. The authors share the general definition of the term.

Colluvium formation is closely connected with the geological and geomorphological peculiarities of the area. The natural conditions of the equatorial zone of the Andes mountain region are favorable to colluvium formation processes. Steep slopes, bedrock exposure, valleys and gullies with almost upright slopes, landslide developments alongside with the climate conditions lead to spreading of variable colluvial deposits in the region.

It is appropriate to denote the difference in the spatial distribution of colluvium. The colluvium debris of the lower part of slopes in the mountain area, in the area bordering the piedmont, for instance, can be classified as the regional level of the deposits. The deposits of the local level are those formed on the piedmont slopes and plains. The formation of the colluvium at the micro-local level takes place within particular parts of slopes, gullies, scarps, micro-landslides.

In most cases, colluvium is heterogeneous material composed of sediments of various sizes, density, and genesis which is further converted by natural processes. “The freshly formed” colluvial deposits appear to be involved into the conversion by the means of flowing water, aeolian processes, plant influence. Hypergenesis takes place. The migrating of deposits to lower parts of slopes is provoked by the action of gravity and landslide developments that add fresh sediments to colluvium.

The investigation was carried out in the key site located in the northern suburb of Quito, near the settlement of Zabala, almost at the equator line, 2500–2800 meters above sea level. This is a suburban zone with the lands withdrawn from agriculture. The area is characterized by widespread gullies developed in modern residual deposits.



Figure 1. Colluvial deposits in a gully.

The Sufficient elevation changes and inclination angles create the conditions for the formation of linear erosion and provoke landslide developments. As a whole, the climate characteristics are favorable for erosion processes. The mean temperature is 14 °C, slightly varying through the months. Liquid forms of precipitation prevail with a considerable proportion of rainfall. The soils are severely eroded. A number of research papers deal with erosion and accumulative formation processes in the territory [2–4]. Deep erosion trenches cause the creation of steep, almost vertical gully slopes which are underlying premises for the colluvium formation.

Taking into consideration the theoretical survey given above, it is supposed to find the difference in the texture of the deposits and the slope soils that served as the parental material for their formation. The difference is to depend on the duration of the period that the deposits were lying at the slope foot and the intensity of the climate factors affecting on the colluvium formation process. The soil texture parameters were used as the indicators of the process. Figure 1 shows a gully typical for the key site area.

The samples were taken from the gully walls and the foot of the slope. The texture analysis was carried out at the laboratory of *Agrocalidad*, Quito. The data is presented in Table.

Table.

TEXTURES OF THE COLLUVIUM AND THE SOIL OF THE GULLY SLOPE

<i>Depth of Sampling, m</i>	<i>Particle Relation in the Samples</i>	<i>Percentage share</i>
0.4–0.5	Sand	64
	Silt	26
	Clay	10
2.0–2.5	Sand	54
	Silt	38
	Clay	8
4.0–4.5	Sand	56
	Silt	34
	Clay	10
6.0 (Colluvial deposit)	Sand	58
	Silt	34
	Clay	8

The achieved results reveal the coincidence of the soil texture of the gully slopes and the texture of the colluvial deposits. The investigation was carried out after the dry season in 2016. Figure 1 shows the annual distribution of precipitation in the explored area according to “Instituto Nacional de Meteorología e Hidrología del Ecuador” (<http://www.serviciometeorologico.gob.ec>).

Therefore, it seems possible to conclude that the explored colluvial deposits are recently formed, obviously, in the dry season of 2016 as a result of landslide developments on the gully slopes. The impact of additional factors could be considered minimal. Such gullies characterized by the texture of the slope soil congruent with the colluvium texture are widespread in the area of the explored key site. Thus, a conclusion may be done that such processes are typical for the region.

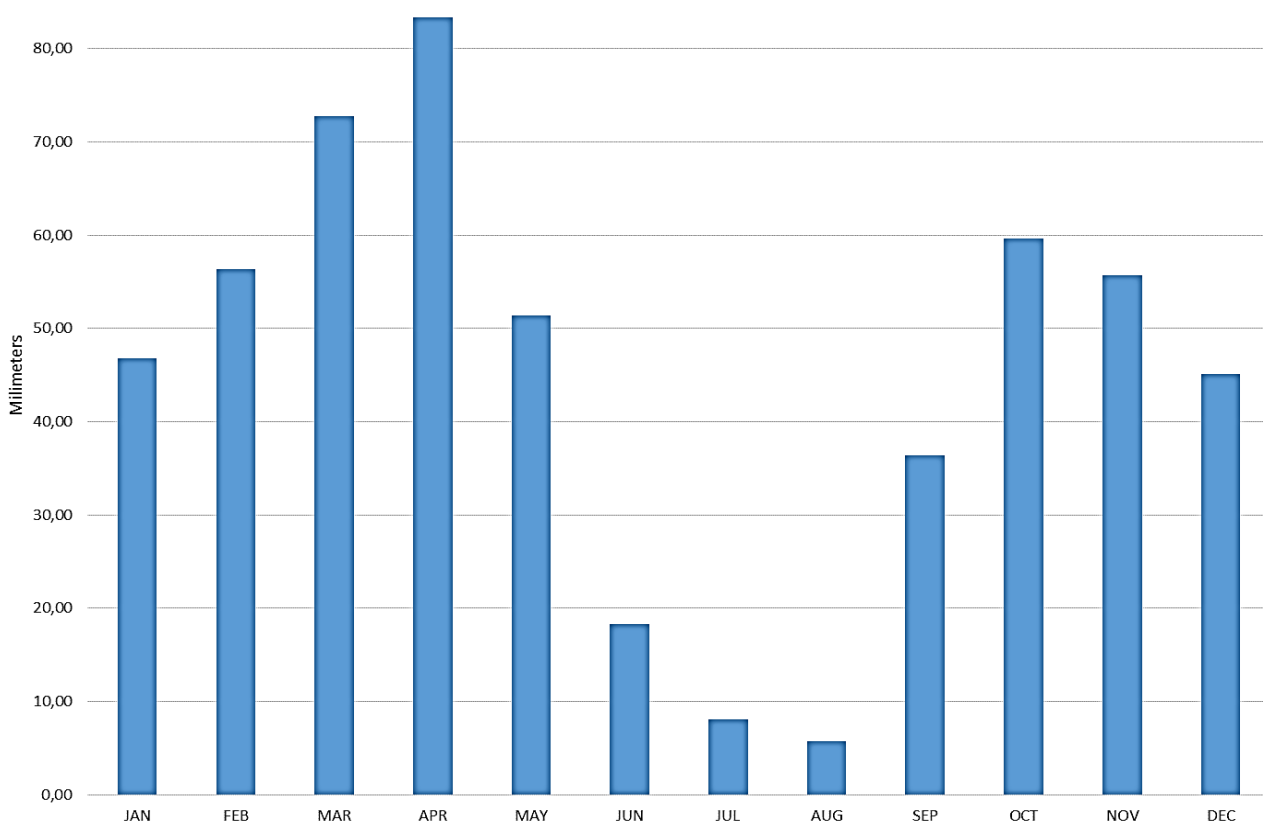


Figure 2. Annual distribution of precipitation (mm) in the key-site.

The explored territory is characterized by widespread gullies, landslide developments, slope processes that lead to the formation of the colluvium. However, the dynamics of the deposits conversion process depends on the season, wet or dry.

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