

Geology of the East Side Hills of the Rio Magdalena from Neiva to Villavieja, Colombia

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INTRODUCTION

In the east side of the Rio Magdalena from Neiva to Villavieja in the upper Magdalena Basin, Colombia, late Cenozoic sediments exposed widely. Especially, in the northeast of Villavieja, the sediments which belongs to the Miocene Honda Group are exposed. They are composed of conglomerates, sandstones and silty claystones (Fields, 1959). The sediments exposed in this area is well known by occurrence of fossil mammals and other vertebrates fossils (La Venta fauna) (Stirton, 1951).

In 1981, I researched the geology in this area and present here the results of geological survey.

GEOMORPHOLOGIC AND GEOLOGIC OUTLINE OF COLOMBIA

In order to clarify the geomorphologic and geologic situation of the surveyed area, at first, geomorphologic and geologic outline of Colombia is introduced on the basis of Stibane (1975).

Colombia is essentially divided into two large geomorphological regions. They are the Llanos and the Andes area (Fig. 1). The former is a lowland which is generally under 200 m in height, and occupies the eastern area of Colombia. The latter is a mountaineous area which occupies the western area of Colombia. The Andean mountain range is subdivided into three ranges in Colombia. They are the western Cordillera Occidental, the Cordillera Central, and the eastern Cordillera Oriental. The wide longitudinal valley between the Cordillera Occidental and the Cordillera Central, the Rio Cauca flows from south to north into Caribbean Sea, and the Rio Magdalena flows in the valley between the Cordillera Central and the Cordillera Oriental.

The basement of the Llanos area is composed of Precambrian crystalline of the Guiana Shield. Early Paleozoic sequence outcrops in the Sierra de la Macarena, and Cretaceous sediments are developed far to the east. Tertiary sediments are restricted to the sub-Andean trough.

Cordillera Oriental consists mainly of crystalline rock of the Guiana Shield, metamorphosed rock of the Cambro-Ordovician, Devonian and Carboniferous sequence, and Permian sediments. Terrestrial sediments of early Jurassic is distributed around the massif consisting of older rocks. Thick Cretaceous deposits covers wide area of the Cordillera Oriental.

Cordillera Central is composed mainly of metamorphic (Cambro-Ordovician sediments) and igneous (Cretaceous batholith etc.) rocks.

Cordillera Occidental is composed mainly of Mesozoic sediments and volcanics.

Four Tertiary basins were constructed by a gradual uplifting of three ranges of the Andes.

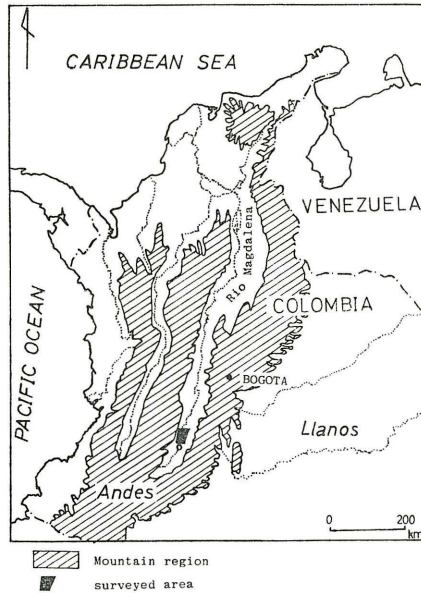


Fig. 1. Index map (Geomorphologic outline of Colombia and the surveyed area).

They are Sinclinorio del Pacifico, Sinclinorio del Cauca, Sinclinorio del Magdalena, and Sinclinorio pre-Andino from west to east. These sediments are composed mainly of thick terrestrial sediments except of marine facies in the Sinclinorio del Pacifico.

The surveyed area is located in the upper Magdalena Basin between the Cordillera Central and Oriental (Fig. 1).

GEOLOGY OF THE EAST SIDE HILLS OF THE RIO MAGDALENA FROM NEIVA TO VILLAVIEJA

In this chapter, lithologic character is described in the area northeast of Villavieja and along the road from Neiva to Villavieja.

The surveyed area is hills which is located at the east side of the Rio Magdalena in the Upper Magdalena Basin, between Central and Eastern Cordilleras (Fig. 1, Fig. 2). Altitude in this area ranges from about 400 m to 500 m above sea level. Because of the semiarid climate, this area is characterized by escarpments, gullies and mesas.

In the Upper Magdalena Basin, as much as 12,000 m of nonmarine Cenozoic deposits are preserved (Van Houten and Travis, 1968), and four major alternations of coarse- and fine-grained deposits are recognized. In the surveyed area, the late Miocene Honda Group (the third cycle) and the Mesa Formation (the fourth cycle) are mainly distributed.

A. Northeast of Villavieja

Geology of the northeast of Villavieja was precisely described by Fields (1959). According to his study, the Honda Group in this area is about 700 meters thick, and is subdivided into three parts. The lower part consists mainly of siltstones with sandstones. The middle part is composed mainly of pebble to cobble conglomerates interbedding coarse-grained sandstones and siltstones. In the upper part, lithology is characterized by the variable succession of



Fig. 2. Map showing the locations of the surveyed area and routemap along the road from Neiva to Villavieja. A: tuff and volcanic sand B: gravel & sand C: river.



Fig. 3. Drainage pattern and locality map of the La Venta area.

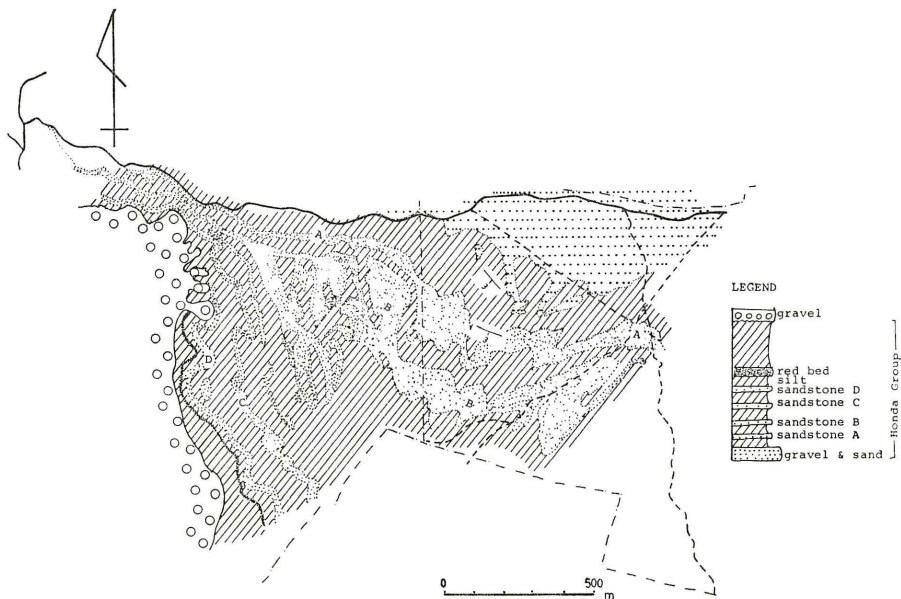


Fig. 4. Lithologic map of the La Venta area.

sandstones, siltstones, claystones and mudstones with two characteristic red beds in the uppermost part.

Geological survey was carried out mainly in the La Venta area in connection with occurrence of fossil mammals. Geologic system in the La Venta area is divided into the Honda Group and the Mesa Conglomerate.

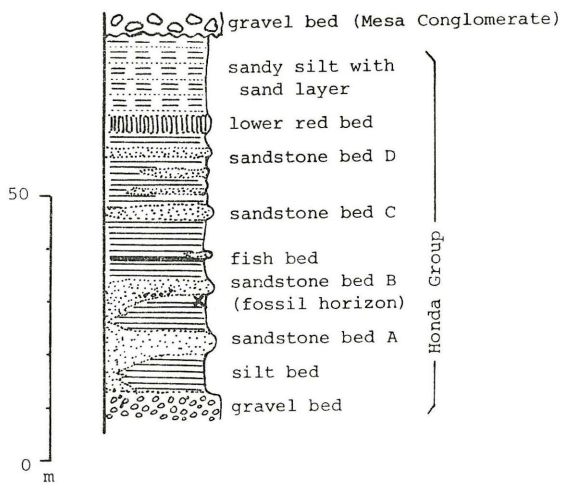


Fig 5. Summarized columnar section of the La Venta area.

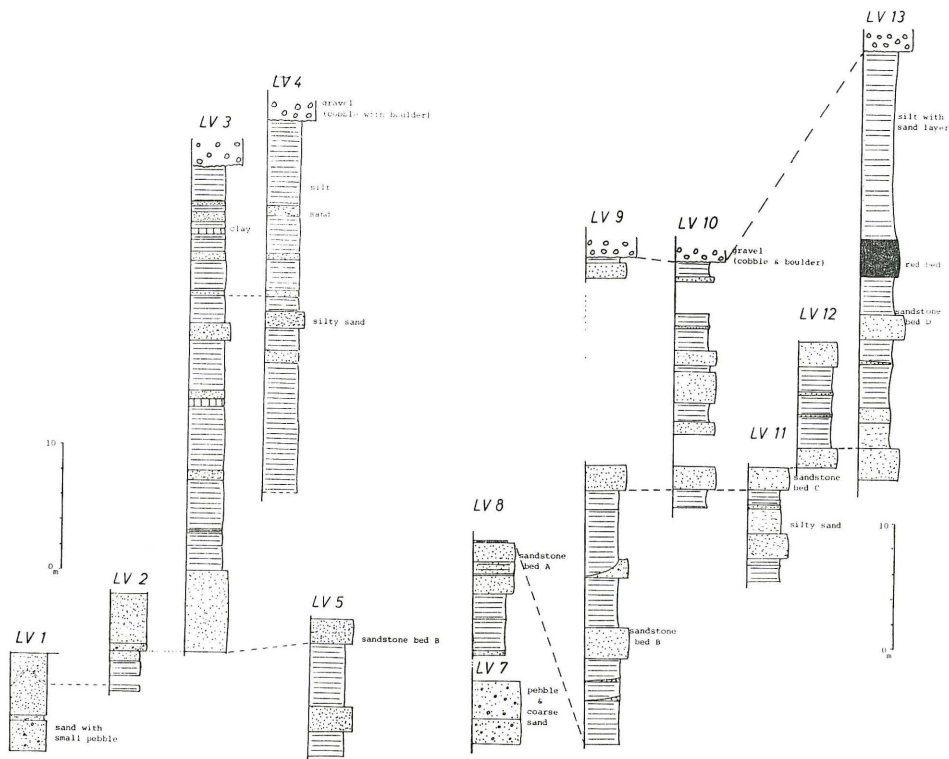


Fig. 6-a Columnar sections in the La Venta area.

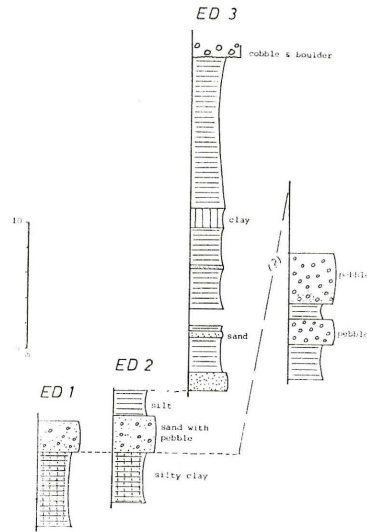


Fig. 6-b Columnar sections in El Dinde area.

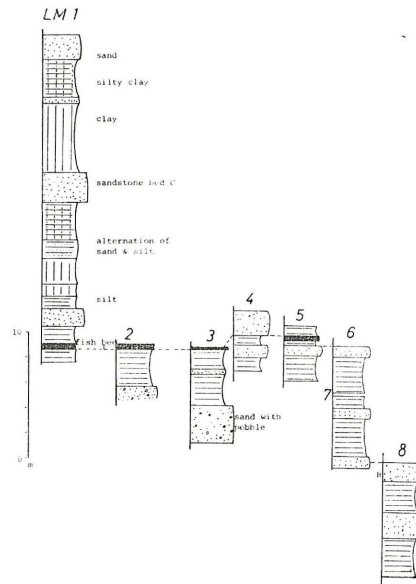
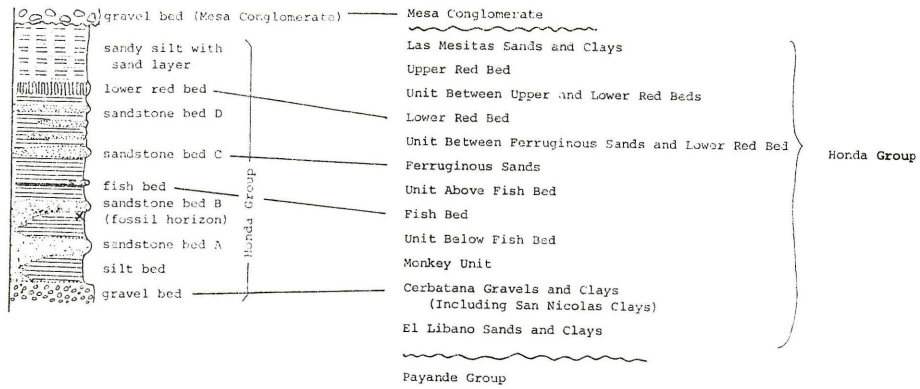


Fig. 6-c Columnar sections in Los Mangos area.

The sediments of the Honda Group in the La Venta area dip gently to southwest (Figs. 3, 4). At the locality LV 3, the beds strike N 60° W and dip 8° SW. The sediments of the Honda Group which can be observed is about 70 meters thick (Fig. 5).

The lower part is composed of pebble to cobble conglomerates with coarse sandy matrix (Fig. 6). Gravels of chert are abundant. Cross beddings are developed in the sandstones. This part is the upper part of the Cerbatana Gravels and Clays of Fields (1959) (Fig. 7). This gravel facies can be also observed in El Dinde area (Fig. 6-b).

The strata between the top of gravel facies and the characteristic red bed is about 50 m thick. This part is composed of irregular alternating beds of sandstones and siltstones, and is



Takemura(this paper)

Fields(1959)

Fig. 7. Comparison to the stratigraphy of Fields (1959).



Fig. 8. Geomorphologic sketch map around the point where the fossil monkey was discovered

subdivided by using characteristic sandstones (A, B, C and D), and they are represented in the lithologic map. Above the weathered surfaces of sandstones, torpedo-shaped concretions can be observed. Siltstones in this part is rather homogeneous and are composed of alternation

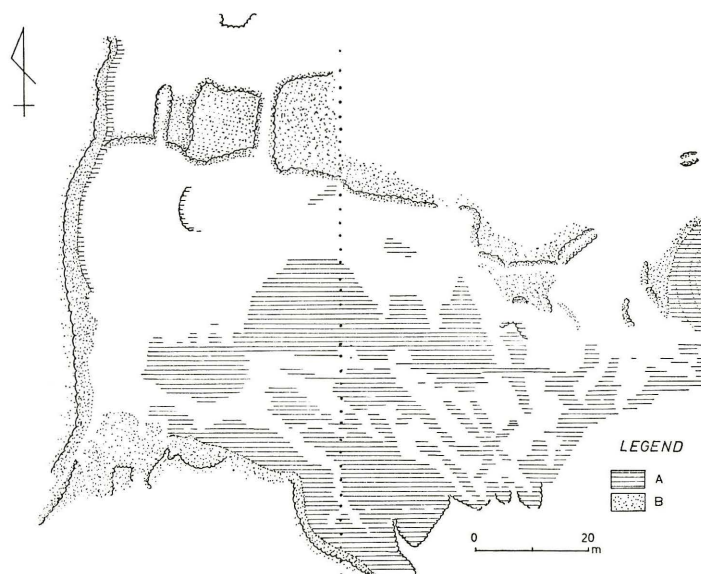


Fig. 9. Lithologic distribution around the point where the fossil monkey was discovered.
A: siltstone, B: sandstone.

of gray and brown part. The occurrence horizon of fossil monkey is siltstone lens below the sandstone B. (Figs. 8, 9)

In the Los Mangos area, this part can be observed. Sandstone bed C forms a broad bench, and this bed is included in the Ferruginous sands of Fields (1959). Characteristic bluish dark gray clay is situated in the horizon of 15 m below the Sandstone bed C. This bed contains abundant fish vertebrae, and is included in the Fish bed of Fields (1959).

The Red Bed is the useful key bed and can be observed at the wall of western Mesa. This bed is about 3 meters thick. This red bed is correlated with the lower Red Bed of Fields (1959).

The strata above the Red Bed is composed of gray to brown siltstones with lenticular sandstones.

The Mesa conglomerate unconformably covers the strata of the Honda Group. This is about 15 meters thick and consists of rounded boulder and cobble gravels. Gravels are chert, granodiorite, andecite and metamorphic rocks.

B. From Neiva to Villavieja

In the east side of the Rio Magdalena from Neiva to Villavieja, the strata including a large amount of volcanic material is exposed widely. This was called the Gigante Formation (Howe, 1969) of the Mesa Group (Butler, 1942), and Van Houten (1976) considered that it was product of latest Miocene volcanism (Fig. 10).

These strata can be observed along the road from Neiva to Villavieja. They consists of irregular alternations of gravel bed (pebble with cobble, sandy and tuffaceous matrix), and volcanic material bed (volcanic sand, tuff and pumice beds) (Fig. 11). They unconformably covers the underlying Honda Group. A single radiometric age determination on zircon gave 7.8 ± 0.5 m.y. by fission-track method (Takemura and Danhara, 1982).

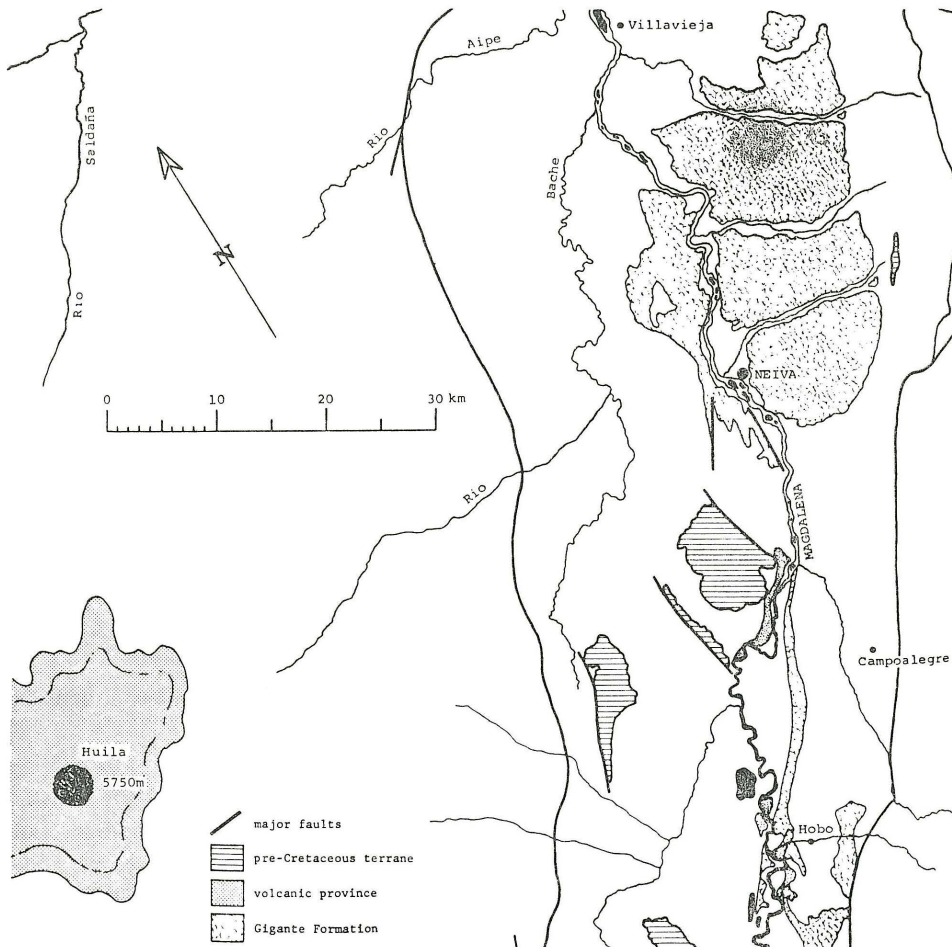


Fig. 10. Distribution of the Gigante Formation around Neiva (Van Houten, 1976).

The relationship between these strata and the Mesa Conglomerate in the La Venta area is not distinct.

SUMMARY

1. Geological survey was carried out in the La Venta area, northeast of Villavieja, Huila, Colombia in connection with occurrence of fossil monkey. Geologic system is composed of Miocene Honda Group and Mesa conglomerate. Strata about 70 meters thick of the Honda Group is distributed, and these strata is correlated with the upper part of the Honda Group in northeast of Villavieja. These sediments are composed of pebble to cobble conglomerate, irregular alternating beds of sandstone and siltstone, red bed and siltstones in an ascending order. Horizon where the fossil monkey was newly discovered is the siltstone lens below the sandstone bed B included in alternating beds of sandstone and siltstone.

2. Along the road from Neiva to Villavieja, the strata including a large amount of volcanic

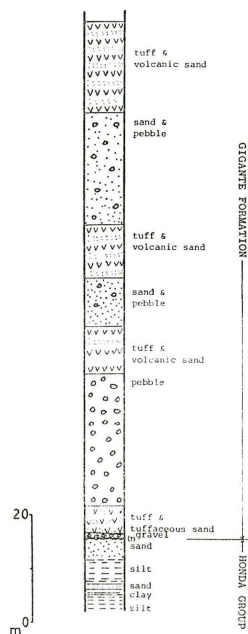


Fig. 11-a. Summarized columnar section of the route from Neiva to Villavieja.

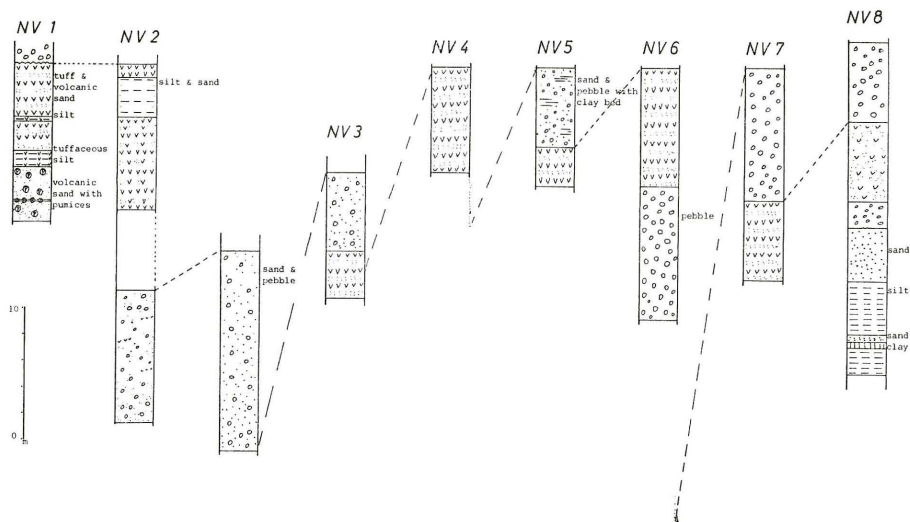


Fig. 11-b. Columnar section at each outcrop along the road from Neiva to Villavieja.

materials are exposed. They unconformably cover the underlying Honda Group, and is correlated with the Gigante Formation of the Mesa Group.

REFERENCES

Butler, J. W. (1942): Geology of Honda District, Colombia. Am. Assoc. Petroleum Geologists, Bull., 26, 793-827.

- Fields, F. W. (1959): Geology of the La Venta Badlands, Colombia, South America. Univ. Calif. Publ. Bull. Dept. Geol. Sci., 32, 405–444.
- Howe, M. W. (1969): Volcaniclastic rocks of Pliocene(?) age, Upper Magdalena Valley, Colombia [Ph.D. thesis]: Princeton, N. J., Princeton Univ., 13 p.
- Stibane, F. R. (1975): Colombia, Encyclopedia of World Regional Geology (Fairbridge, R. W. ed.), Part 1, 245–250, Dowden, Hutchinson and Ross, Stroudsburg, Pennsylvania.
- Stirton, R. A. (1951): Ceboid monkeys from the Miocene of Colombia. Univ. Calif. Publ. Bull. Dept. Geol. Sci., 28, 315–356.
- Takemura, K. and Danhara, T. (1982): Fission-track age of pumices included in the Gigante Formation, north of Neiva, Colombia. Kyoto University Overseas Research Report of New World Monkeys (1981): 13–15, Primate Research Institute of Kyoto University.
- Van Houten, F. B. and Travis, R. B. (1968): Cenozoic deposits, Upper Magdalena Valley, Colombia. Am. Assoc. Petroleum Geologists Bull., 52, 675–702.
- Van Houten, F. B. (1976): Late Cenozoic volcaniclastic deposits, Andean foredeep, Colombia. Geol. Soc. America Bull., 87, 481–495.