# THE PALEO ENSO RECORD IN THE LOWER MAGDALENA BASIN, COLOMBIA

by:

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The Lower Magdalena Flooding Basin is a vast low-plain area located in the Caribbean region of Colombia with an average altitude of 20 meters above sea—level, this being where the two most important Colombian rivers, the Cauca and the Magdalena rivers join. The, apparently cyclic, flooding periods of this basin are caused more by the increasing rains in the mountain areas of the Western, Central and Eastern mountain ranges, which are drained by the Çauca and Magdalena rivers, than by those taking place within the Fooding Basin, as such. Due to its extension it is considered as one of the large fluvial flooding areas in the world, and has come to be known as the "Interior Magdalena Delta" (Fig. 1).

This Flooding Basin has displayed constant subsidence phenomena over the last 10,000 years, and it is due to this that it accumulated a thick sequence of Quaternary sediments. The calculated subsidence for this region varies between 2.92 mm./year and 6.13 mm./year (HIMAT. 1977).

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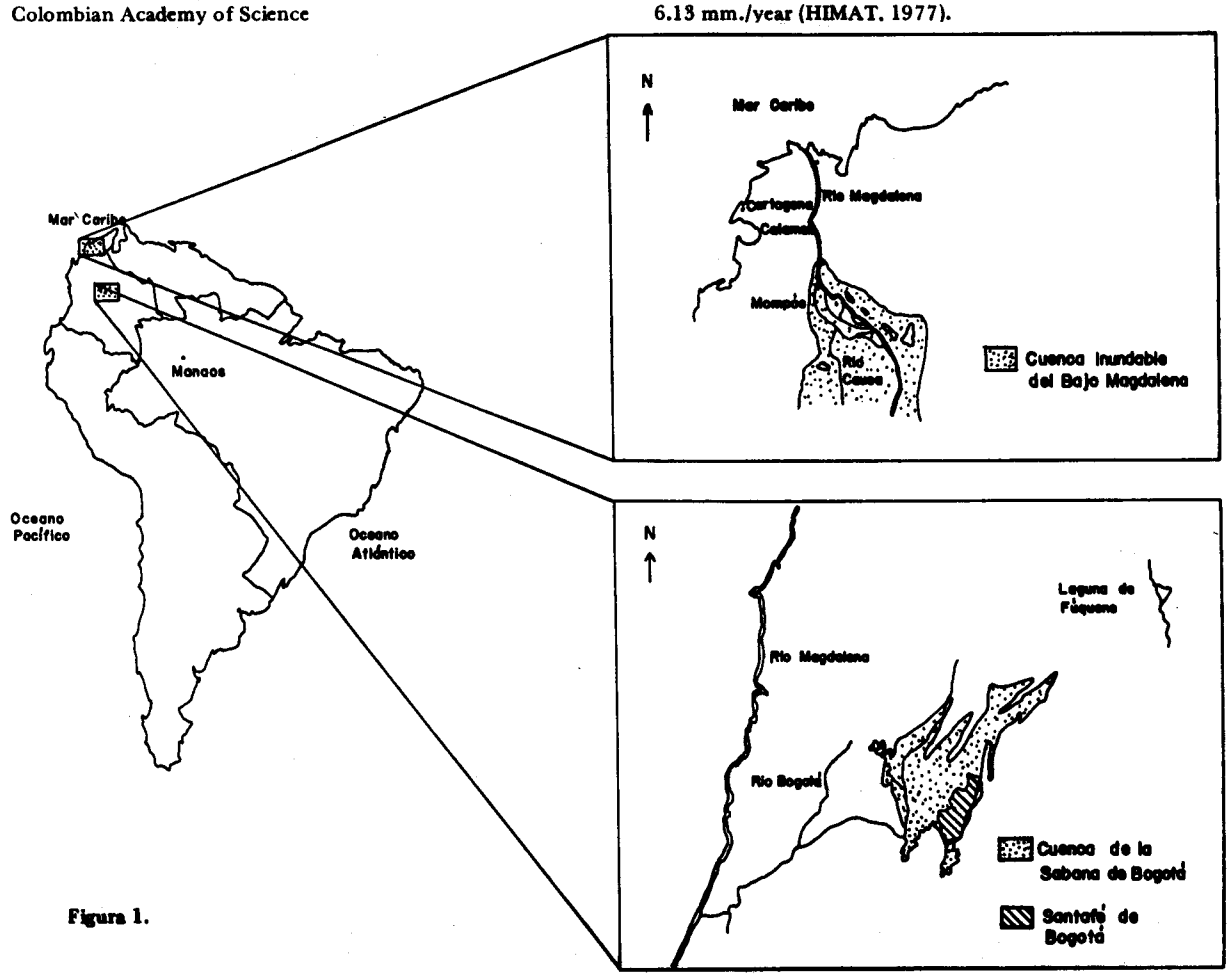


Figura 1.

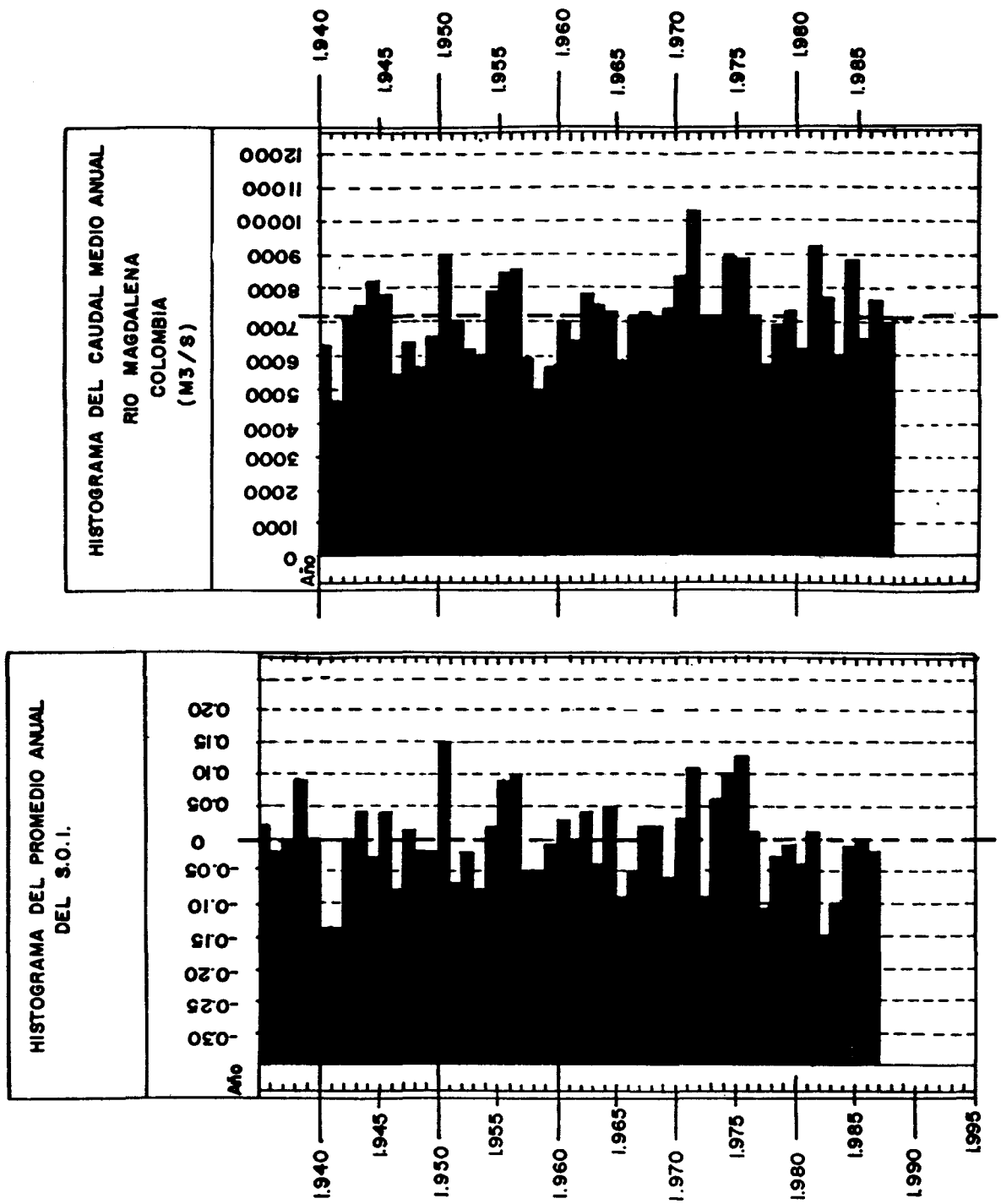


Figura 2.

The HIMAT meteorological station in the town of Calamar (Department of Bolivar) is the one that best registers the periods of maximum and minimum water volumes for the Magdalena River, which are coincidental with the flooding and dry period of the Flooding Basin. The monthly hydrological data for the Magdalena River has been continually registered as of 1940 (HIMAT, 1991).

When comparing the (monthly and anual) records for the Magdalena River of the Calamar station with the (mounthly and anual) records of the Southern Oscilation Index (C.A.C.) published by the World Climate Programme, a good correlation can be observed between the low–volume periods for the Magdalena River (dry periods for the Flooding Basin) and the lower–value periods for the Southern Oscilation Index; which also correspond to the presence of the "el Niño" phenomenon. (Fig. 2).

The relationship between dry periods and the presence of the "El Niño" phenomenon has also been established for Indonesia, Australia, and the Peruvian Highlands.

Eight stratigraphic wells were drilled in the Lower Magdalena Flooding Basin during 1970 and 1971; the deepest of these reaching 51.40 m (Sucre). Within the sequence of continental lagunar clays making up the upper part of the sedimentary infill, it is possible to identify different peat layers which are a clear indication of the fact that the lake partially dried up and turned into swamps.

The Law of Uniformitarianism (valid for the Holocene) allows us to suggest that a relationship exist between these peat layers and the Paleo–ENSO phemomena. Carbon 14 datings have enabled us to register dry periods in the Flooding Basin toward

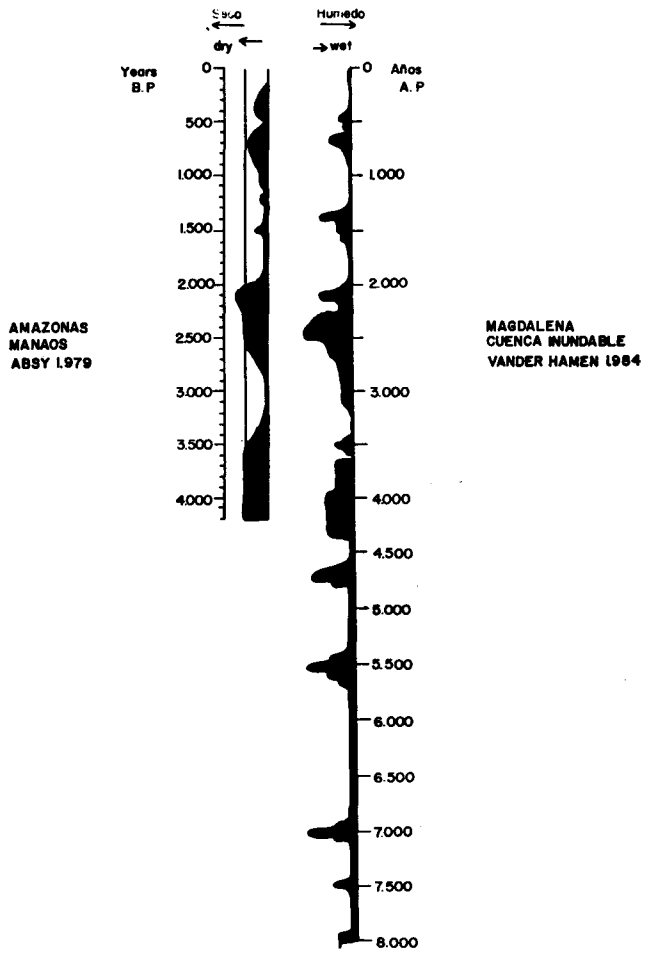


**Figura 3.** Bajos y altos niveles de inundación de los ríos Amazonas y Magdalena.

7,000 B.P., 5,500 B.P., 4,700 B.P., 4.000 B.P., 2,500 B.P., 2,300 B.P., 1400 B.P., and 700 B.P.; and it is precisely for these dates that we propose the presence of the Paleo–ENSO phenomena.

Taking into account the extension of the peat–layers in the Flooding Basin **Van der Hammen** (1986) set up the water level curve for the last 8,000 years. By comparing this curve with the one presented by **Absy** (1979) for the water–levels of the Amazon River, in Manaos (Brazil), it is observed that the periods with high and low floodinglevels of both the Amazon and the Magdalena Rivers do correlate to one another, thus, extending the coverage of the Paleo–dry periods, or the Paleo–ENSO phenomenon through out the northern part of the South American Continent. (Fig. 3).

The presence of these "Paleo–ENSO" could have brought about cyclic droughts or dry periods during the Pleistocene which could have favored the savannization of the Amazonia along with the development of forest refugia which, thereby favored the diversification and specialization of tribes fauna and flora (**Haffer** 1969, **Vanzolini & Williams** 1970, **Brown** 1977, **Brown & Sheppard** 1974, **Mullar** 1972, 1973, **Meggers** 1977, **Prance** 1977, among others). According to **Kromberg** (1990) these dry periods could go as far back as + /– 50,000 years.

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