CRETACEOUS-PALEOGENE STRATIGRAPHIC SEQUENCES AND THE EARLY ANDEAN OROGENIC EVENTS IN THE ECUADORIAN ORIENTE BASIN

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INTRODUCTION

The stratigraphic sequence of the Ecuadorian Oriente Basin, is strongly influenced by the early Andean orogenic events, which were weak until the Santonian-Campanian. During this time, minor erosional surfaces developed. In the younger parts of the section (Paleocene-Oligocene), the unconformities become stronger and the first molasse deposits appear in response to the western Andean emersion.

GEOLOGICAL EVOLUTION

Aptian - early Albian

The Hollin Formation unconformably overlies the Preaptian eroded and deformed formations (Fig. 1). It comprises a sequence of coarse sandstone fining and thining upward, with minor carbonaceous claystone, siltstone and coal interlayers. It thins to the east and pinchs out near the Ecuadorian-Peruvian border.

This period is characterized by a relative tectonic quiescense. The braided Cretaceous river flowed into the basin, carring the basal sandstones. Later deposition was the result of marine transgresion (estuarine, and tidal enviroments). The main bulk of sandstones seems to be derived from the Paleoamazon system , but an important source was the higlands of the Brasilian-Guyana Shield located in the east and northeast .

Middle Albian - Campanian.

The Napo Formation comprises four members : sandy-shaly Napo Basal, sandy Napo Inferior, limy Napo Medio and shaly-sandy Napo Superior (fig. 1).

The Napo epicontinental marine basin, was characterized by restricted circulation , creating anoxic conditions during the middle Albian, Turonian and Coniacian times. Black and dark organic rich grey shales, marls and limestones were deposited under those conditions. To the east, the rivers flowed into the basin forming deltas and estuaries.

During the Albian - Santonian times, minor synsedimentary movements and reactivations of older faults occured.

For the late Turonian - early Coniacian times, in the outcrop of the Mirador Anticline located in Central Subandean Zone Jaillard E. (1995) reported an unconformity at the top of the Turonian M2 limestones. It's the first indication of an uplift of the Subandean Zone. This event is characterized by reactivation of numerous faults.

In the middle-late Campanian, the Andean uplift, caused by the Macuchi-Continent plate collision (Odin & Odin 1995), is recorded in the uplift of the Subandean Zone, mainly in the Central part of that zone ("Napo Uplift" and " Pastaza Depression"). The Campanian section was almost completely removed by erosion in the North Subandean (ten-twenty feet) of Coniacian sediments. In the Southwest of the Zone (Jaillard E. 1995) the erosion is minimum, and the Campanian deposits (M1 sandstone) are preserved as in the eastern part of the basin.

These facts show a differentiated important uplift of the Subandean Zone. The uplift was stronger in the central area, where the eastern terrains were dragged up. It reached the area of Cononaco and Rumiyacu fields (where the Campanian deposits are almost complete eroded) located in the western flank of the basin. In the Subandean Zone important regional extent oblique tectonic elements seem to control its dynamics.

A small NNO foreland basin formed back to the stronger uplifted zone. It shows that the uplift began at the late Santonian, and some of the paleocurrents began to have eastern directions. An important group of faults were reactivated during the Coniacian - Santonian and their related folds were formed.

Maastrichtian-Paleocene.

The Tena Formation unconformably overlies the Napo Formation in the west, were an important thikness of the Napo Superior was eroded (fig. 1). But to the east, the unconformity changes into a conformity . It comprises a medium-coarse to conglomeratic transgresive basal sandstone and multicoloured claystones and siltstones. This formation gradually thins to the east.

The uplift of western Andean domain caused the withdrawal of the sea from the basin , and set the new west-east directions of fluviatile system. The Guayana-Brazilian Shields continued as a secundary source of sediments during Maastrichtian-Paleocene times (Jaillard E. 1995).

Eocene

As a result of the uplift and erosion of the ancestral Andean ranges, Tiyuyacu conglomerates and coarse sandstones, claystones and siltstones were laid down in the basin . The axis of Eocene basin was almost the same that the present basin axis.

The Andean mountains experimented a multiepisodic uplift, which produced at least two conglomeratic secuences. The main conglomeratic depositation laid down along the northwestern and northcentral areas of the Oriente Basin in alluvial fans and plains.

The preferential deposition in the northwestern portions of the basin is probably due to the Andean ranges, which were nearest in the north than in the south (the altitude was higer in the north). Campbell C. J. (1970) explains the absence of coarse clastic sediments in the Marañon area by the continued existence of the Marañon Portal to the west.

A group of reverse faults and related folds formed . The basin structured in this time, and two subbasins developed: the northern Napo Subbasin narrower than the soutern Pastaza Subbasin , with high density of faulting and folding, which decreases toward the Pastaza Subbasin. The increased structural deformation is the result of Jurassic-Cretaceous extension and subsecuent Tertiary compression being taken up by a more limited rock volume (Jenks 1956 in Dashwood M. F. & Abbots,1990). The faults reactivated at this time, and related folds, together with those reactivated in the Turonian-Campanian, are the more important in the hidrocarbon history.

After Tiyuyacu sedimentation occured diastrophic events related to Andean orogeny wich provoked erosion of those sediments, reaching 5.800 feet at the eastern portion of the basin (Tiputini 1 well. Llerena M. G. 1991)

Oligocene

At the late Eocene the Andean source area were reduced by erosion, and progressively finer sediments were deposited in the basin. A short transgression took place. The Orteguaza deposited (fig. 1). It consists of green shales and sandstones. Afterwards the Chalcana Formation which comprises brown-redish claystones, with subordinate sandstones and conglomerates, deposited under continental to marginal-marine conditions.

There is no evidence of tectonic activity at this time, only sporadic andean uplfting laid down minor conglomerates in the Chalcana formation.

CONCLUSIONS

The first indications of Andean compresion are evidenced by the Santonian-Campanian uplift of the "Napo Uplift" and "Pastaza Depression" in the Subandean Zone.

The basin is almost definetly structured at the Eocene, when the andean compression formed two regional structures: the northern Napo Subbasin, more structured than the southern Pastaza Subbasin.

The Albian-Eocene is a critical time for the hydrocarbon sistem. The productive structures began to develop, the reservoirs rocks and potential source rocks were depositing.

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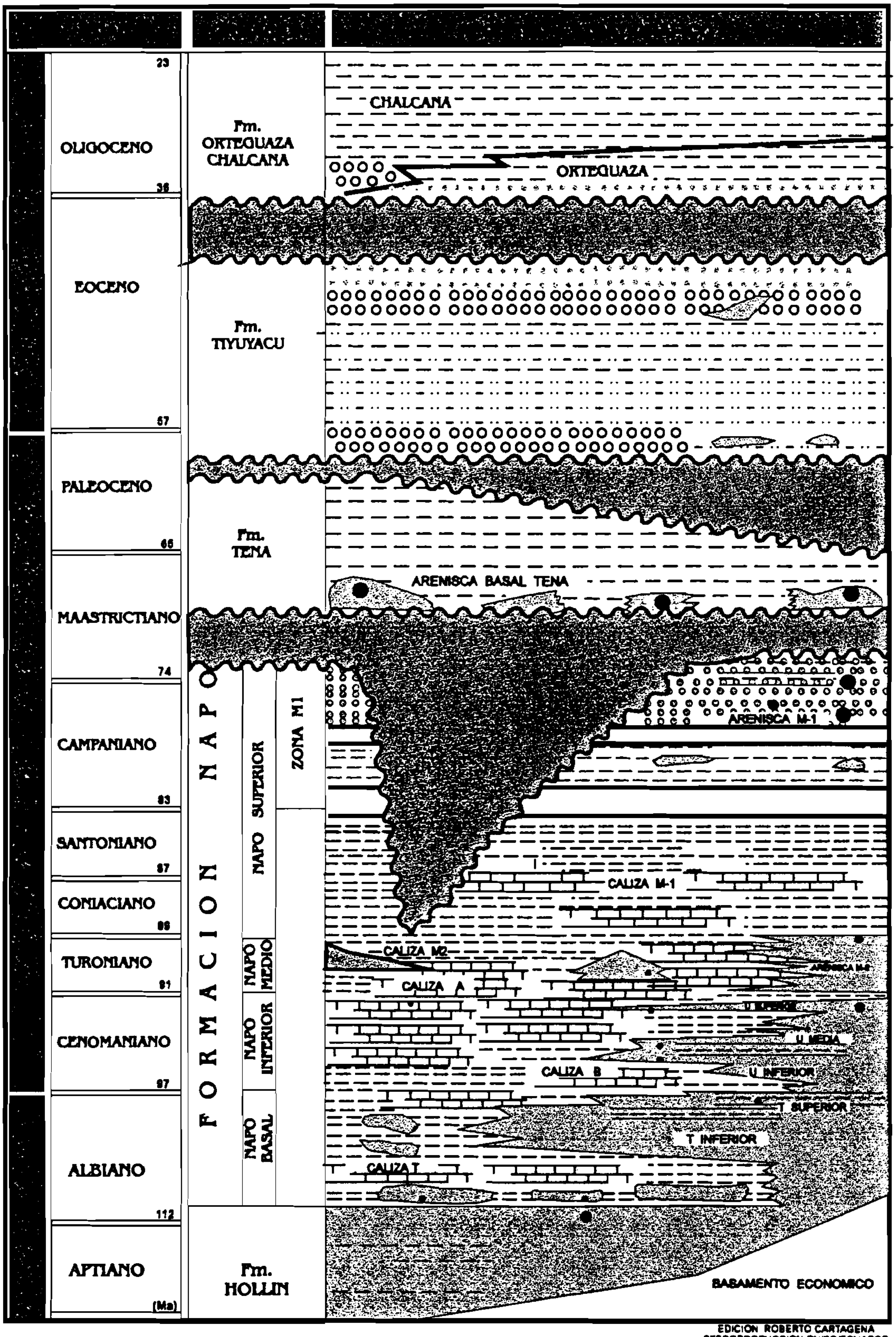

EDICION ROBERTO CARTAGENA
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FIGURE : 1

CRETACEUS AND PALEOGENE CHRONOSTRATIGRAPHIC DIAGRAM OF THE ECUADORIAN ORIENTE BASIN.

● YACIMIENTO DE PETROLEO