

THE MUD-DIAPIR TREND IN THE EASTERN VENEZUELAN BASIN

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KEY WORDS: Eastern Venezuelan, Arcilokinesis, Lower Miocene Shale, Carapita Formation, Mud-Diapir.

INTRODUCTION

The Eastern Venezuelan basin is located south of the Serrania del Interior Oriental range, which represents the easternmost branch of the Andean uplift (Figure 1). The northernmost boundary of the Serrania del Interior Oriental range, is controlled by right lateral strike-slip motion. It includes the El Pilar Fault system, a major dextral fault, considered to be the main contact between Caribbean and South American plates (Fig. 2); its dextral movement, seems to have started in the Upper Miocene; current slip rate is about 1 cm / year and total offset is around 70 km (Audemard and Giraldo, 1997). An igneous – metamorphic and sedimentary Caribbean belt, lying to the north of the El Pilar fault, was progressively thrust over, against the South American passive margin (from west to east), during the Eocene / Miocene times (Audemard and Lugo, 1994). Towards the east, the Serrania del Interior Oriental range, ends up against a series of plio / pleistocene grabens (i.e. San Juan), related to a NE -SW tectonic extension. More information, about seismic stratigraphy and tectonics, appears in Di Croce (1995), Hung (1997) and Ysaccis (1997). The mud diapir tract and its related structures occupies an WSW - ENE trending belt that stretches from Tonoro, to the west, to Pedernales in the Orinoco delta. These features, two hundred kilometers long and ten wide, have also been reported offshore and onshore in Trinidad with various degrees of activity that range from mud emanations to mud volcanoes, which occasionally rise above sea level. Also associated to this diapir trend a number of oil and gas seeps as well as asphalt lakes have been discovered. The age of diapirism seems to be restricted to a period from Pliocene to Recent. Seismic transects perpendicular to diapir development evidence both their geometry and growth (Fig.2).

CONCLUSIONS

The Plio-Pleistocene Mud-diapir trend has been well documented from seismic sections, south of the Serrania del Interior Oriental range. The age of remobilized shales is lower Miocene, and have been identified as part of the shaly section of the Mid. Miocene Carapita Formation, considered as a major seal in the basin. This trend runs parallel to the negative gravimetric anomaly located in the foredeep. The most intense arcilokinetic effect lies immediately southeast of the San Juan graben system; the observed gravimetric anomaly (Fig. 2) reaches its minimum value (200mgals); intensity of arcilokinesis decreases progressively disappearing altogether toward the west. The associated Mud ridges are very conspicuous, and formed during Pliocene to Recent times, causing the overlapping geometry of youngest sediments (Figs.3 and 4). The uplift of Miocene shale is about 2.5 seconds

(TWT) and rotated onlaps are good indicators of recent uplift. Probably, the shale remobilization, produces a void effect towards the north, that accommodates normal faulting at the San Juan Graben. This Mud diapir trend, has been identified by oil explorationists, since the beginning of this century (Hedberg, 1950), documented from seismic lines by Liliú (1990) and Duerto (2002).

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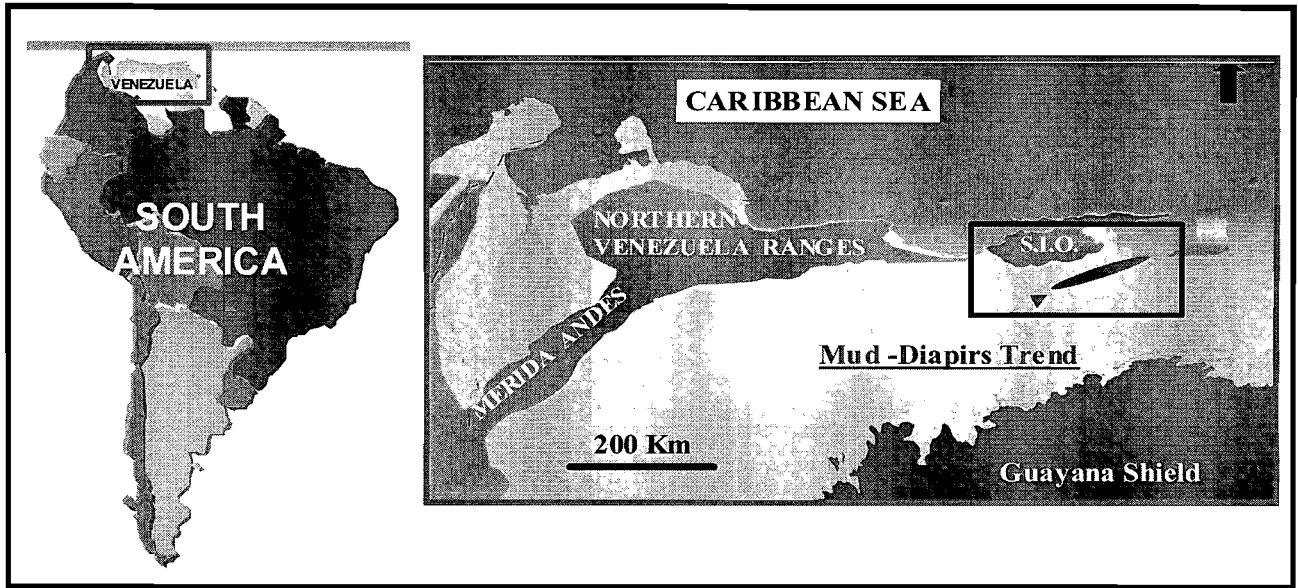


Figure 1. Location of the Mud-Diapirs Trend (S.I.O.= Serranía del Interior Oriental).

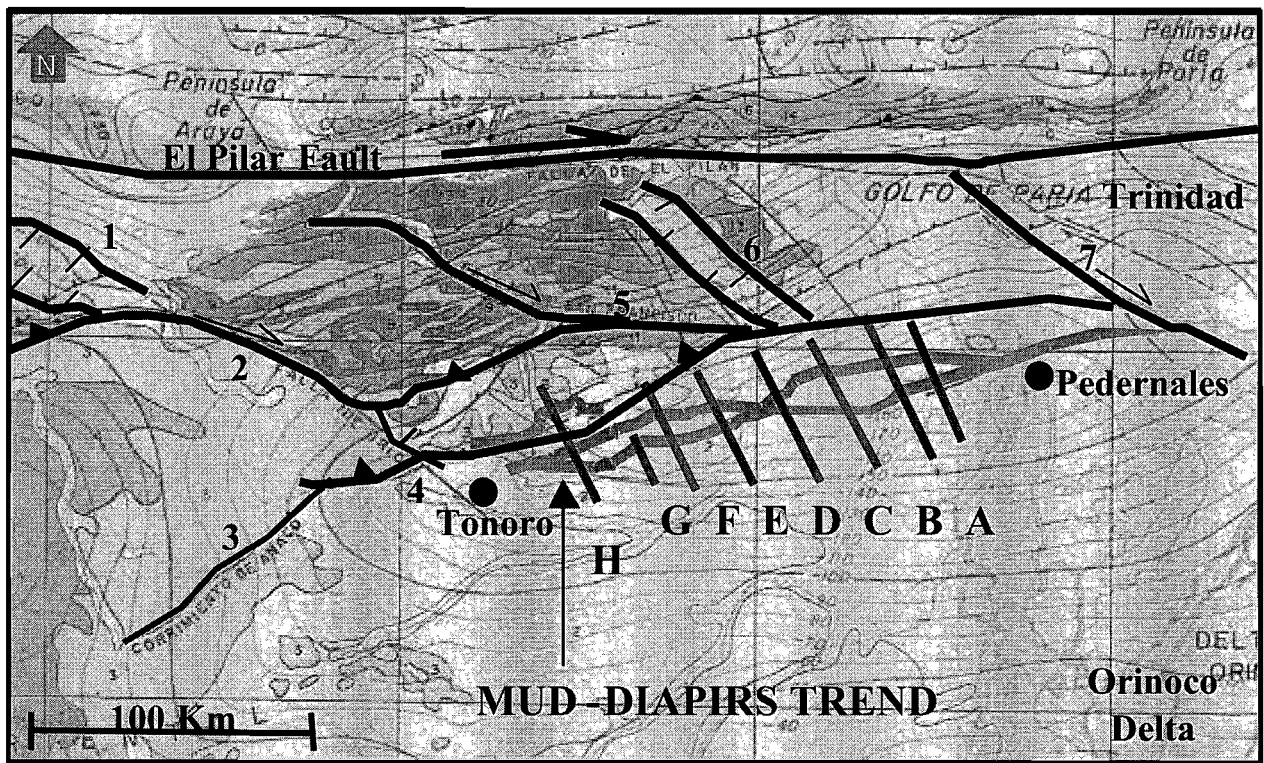


Figure 2. Tectonic setting: 1. Píritu Graben, 2. Urica Fault, 3. Anaco Thrust, Tala-Piritual Thrust, 5. San Francisco Fault, 6. San Juan Graben, 7. Los Bajos-El Soldado Fault (Mod. From PIMENTEL, 1984).

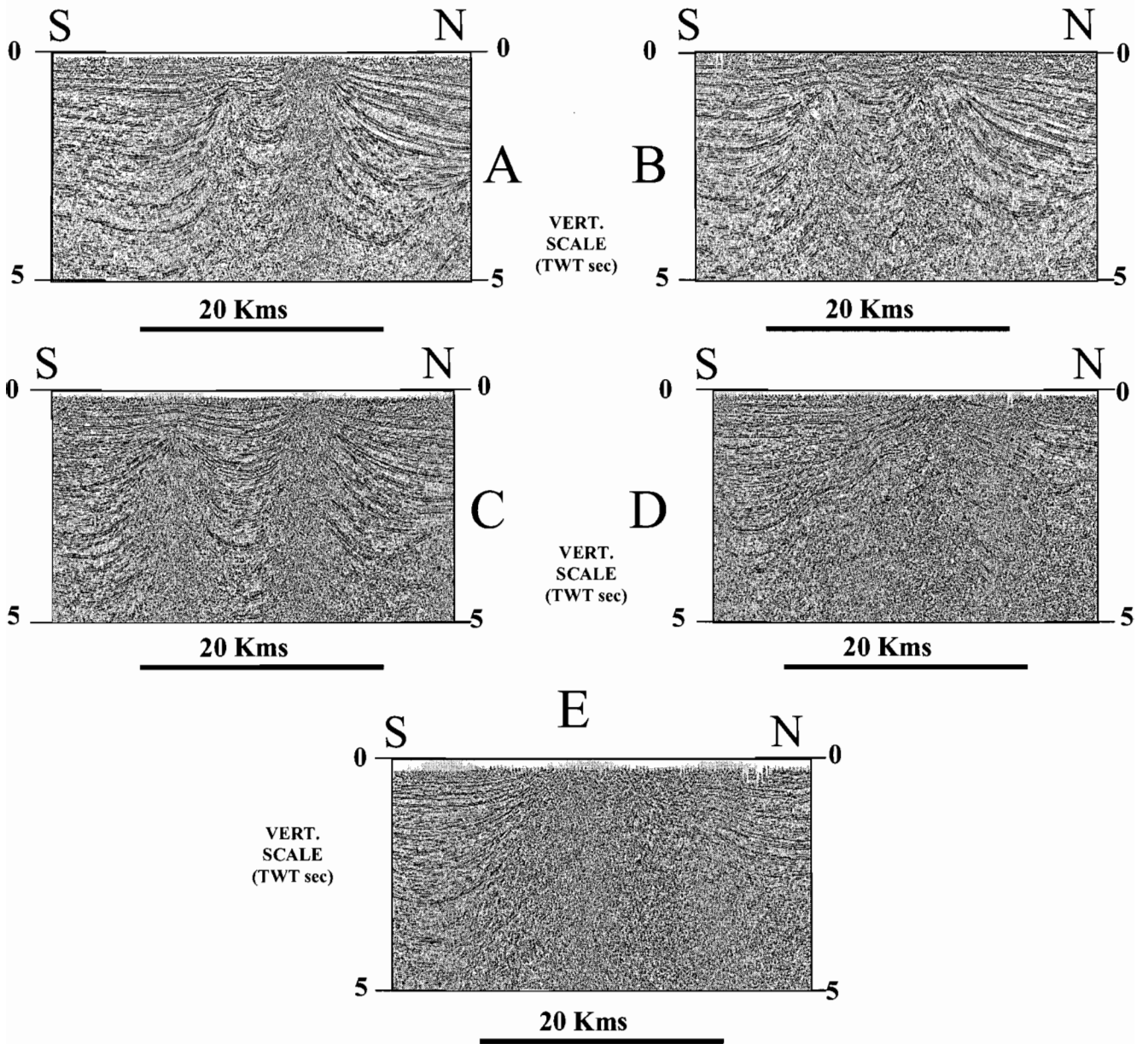


Figure 3 Seismic sections showing Mud-Diapirs (see Figure 2 for location).

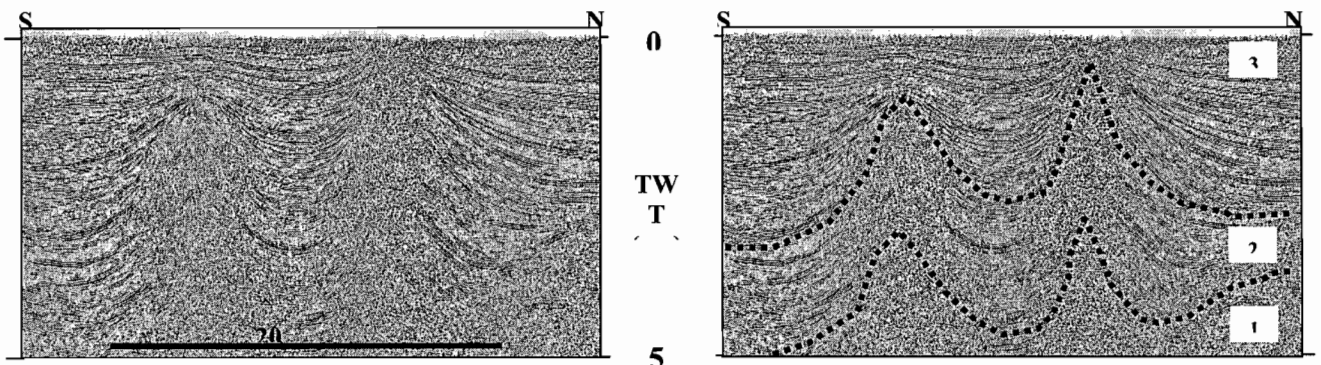


Figure 4 Interpretation of Section C; 1: L. Mioc. Shale, 2:Mid. Miocene, 3:Plio-Q., Unc=Unconformity.