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Hyperpycnal sedimentological model of the Merecure Formation, Oligocene, Northern Monagas State, Maturin Sub-basin, Venezuela

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This paper shows the results of the study carried out in the traditional northern area of Monagas State, specifically in the Merecure Formation, one of the main hydrocarbon-bearing units in the Eastern Venezuelan Basin. During this investigation was integrated the information of 57 wells which had core data with a total thickness of 24,000 feet and over area of 1,400 km². Facies classification was done using a genetic and predictive facies tract (Zavala *et al.* 2007) which allowed differentiating a total of 12 sedimentary facies. The recognized facies were divided in two groups, bedload and suspended load. Depositional model permitted to apply the new methodology of genetic facies analysis development by Zavala *et al.* 2007, to process huge core data; and them, to elaborate index maps of the genetic facies distribution. The indexes were calculated from of relation between bedload and suspended load facies obtaining adimensional numbers that fluctuate from 100 to 0. According to Zavala, Pt index measures how proximal the core is located respect to the hyperpycnal system as a whole. Lt index gives an indication of how lateral the core is located respect to the flow axis. Pt (Proximity) and Lt (Lateraty) indexes were calculated and mapped in the whole study area within a sequence stratigraphic framework which show three depositional sequences of third order called in this study such as M1, M2, and M3. As a result, the Merecure Formation is composed by more than 1,000 feet of marine shelf clastic deposits where each individual sandstone bodies was studied and analyzed showing up to 30' thickness. These deposits were accumulated in an elongate basin oriented Northeast - Southwest, located between an active mountain front (North) and the Guayana shield (South). The facies analysis suggests that these sediments were deposited from gravitated sediment flows directly related to river discharge of high density and long duration (hyperpycnal systems) associated to a marine platform environment. Index mapping permitted to predict source areas, facies distribution, and reservoir quality in undrilled areas. The facies identified showed mainly massive to cross-stratified pebbly sandstone grading from massive coarse fine grained to laminated fine grained sandstone toward basinward. The bedload facies group are composed for coarse grained and related to drag forces provided by the overpassing turbulent flow while the suspended load facies group are composed of fine grained sandstones and relate to the gravitational collapse of the suspended load as the long-lived flow progressively wanes basinward and also are the result of the fallout of very fine grained sands, silts, plant debris and micas from lofting plumes mainly in the flow margin areas. Based in the petrographical analysis and core description was defined that main sediment source is from cratonic areas located in the south and south-east of Venezuela basin. Also, it demonstrated that is possible to think a close relation between reservoir properties and facies group considering that bedload facies group shows the best petrophysical properties than suspended facies group. In general, bedload facies group has good porosity caused by its original open packing; but fine grained materials deposited in pore space would affect permeability decreasing this property; however, petrographical results showed that fine grained material was dissolved by diagenetic processes. Finally, the index genetic map allowed predicting the reservoir quality in undrilled areas and thus to propose new wells in the best reservoir quality area.

Zavala, C.; Marcano J.; Carvajal J., 2007. Proximity and Laterality indexes: a new tool for the analysis of ancient hyperpycnal deposits in the subsurface. GSTT 4TH GEOLOGICAL CONFERENCE "Caribbean Exploration – Planning for the Next Century" June 17-22, 2007 – Port of Spain, Trinidad.