

Cretaceous-Tertiary Petroleum Systems in the Eastern Venezuela Basin

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The integration of geochemical results from rock, oil, and gas samples to geological, palentological and seismic data allowed the identification of three petroleum systems in the North Central area of the Eastern Venezuela Basin, *e.g.*, San Antonio-Oficina, Los Jabillos-Oficina (!) and Areo-Oficina (!).

Based on geochemical characteristics, both oil and gas in these two petroleum systems can be separated in two major groups. Oil Family A with predominance of *n*-alkanes $< C_{15}$ and C_{27} steranes, low pristane/phytane ratio (< 1.6) and oleanane index (< 0.2), presence of gammacerane, sulfur content between 0.33 and 0.54%, and $-28\text{‰} < \delta^{13}\text{C} < -27\text{‰}$. Oil Family B has a bimodal distribution of *n*-alkanes and predominance of $> n-C_{24}$, very high pristane/phytane ratio (≈ 10) and oleanane index (up to 1.5), low gammacerane index and sulfur concentrations, C_{29} compounds are the most abundant among the steranes, and $-29\text{‰} < \delta^{13}\text{C} < -27\text{‰}$. Gas Family A is characterized by relatively heavier and constant values of $\delta^{13}\text{C}$ (C_1 - C_4) and shows higher thermal maturity, suggesting an origin from deeper pods, and gas Family B is relatively depleted in ^{13}C and features a composition suggesting longer distances of migration.

The source rocks that have been identified in the area are compatible with these two distinct oil and gas families. One group is represented by Late Cretaceous-Paleocene anoxic sediments deposited in a carbonate-marine environment with influxes of siliciclastics, and the other group represents Late Cretaceous-Tertiary anoxic-disoxic sediments deposited under neritic marine conditions receiving significant influxes of siliciclastics and higher plants.