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Geological Processes Controlling the API Lateral Variations in Naricual Formation. Bosque-Bucare Area. Eastern Venezuela

The API gravities and Gas/Oil ratio in the Bucare-Bosque field decrease towards east in Nar-1 reservoir of the Naricual Formation (Upper Oligocene- Lower Miocene).

Geochemical tools were applied to seven wellhead samples to investigate four natural process usually related with API gravity variations; different maturity pulses from the source, biodegradation, segregation and evaporative fractionation.

Bulk parameters like sulfur, vanadium and nickel as well as saturates and asphaltenes content show a clear relationship with the API gravity. The paraffin/isoprenoid ratios, biomarker parameters in saturates (Ts/Ts+Tm, diast/regular sterane), biomarkers in the aromatic fraction (methyl-fenantrene index, and MDB index) and isotopic ¹²C/¹³C ratios in saturated and aromatic fraction, show a direct relationship between the oil-maturity, bulk parameters and the API/GOR variations.

Paraffin distribution, demethylated hopanes, light-end compound ratio and bulk vs depth plots, do not support a direct relationship between the API/GOR trend and biodegradation, gravitational segregation or evaporative fractionation. Geochemical fingerprints and API/GOR variations react to geological process related to oil maturity, at the same time oil maturity responds to the generation and entrapment process from the source rock, in this case Upper Cretaceous, Guayuta Group, into the Naricual reservoir.

Lateral compositional heterogeneities are well preserved in this reservoir with poor petrophysical characteristics (2-40 milidarcies and 4% porosity in average). Modeled geological scenarios estimate the beginning of the charge from the source rock at 16 m.y. from present and the first pulse of oil was, most likely emplaced, toward the east where lower API gravities oils prevail.